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March 2, 1973-March 1, 1974

Environmental Protection Agency, Washington, D C

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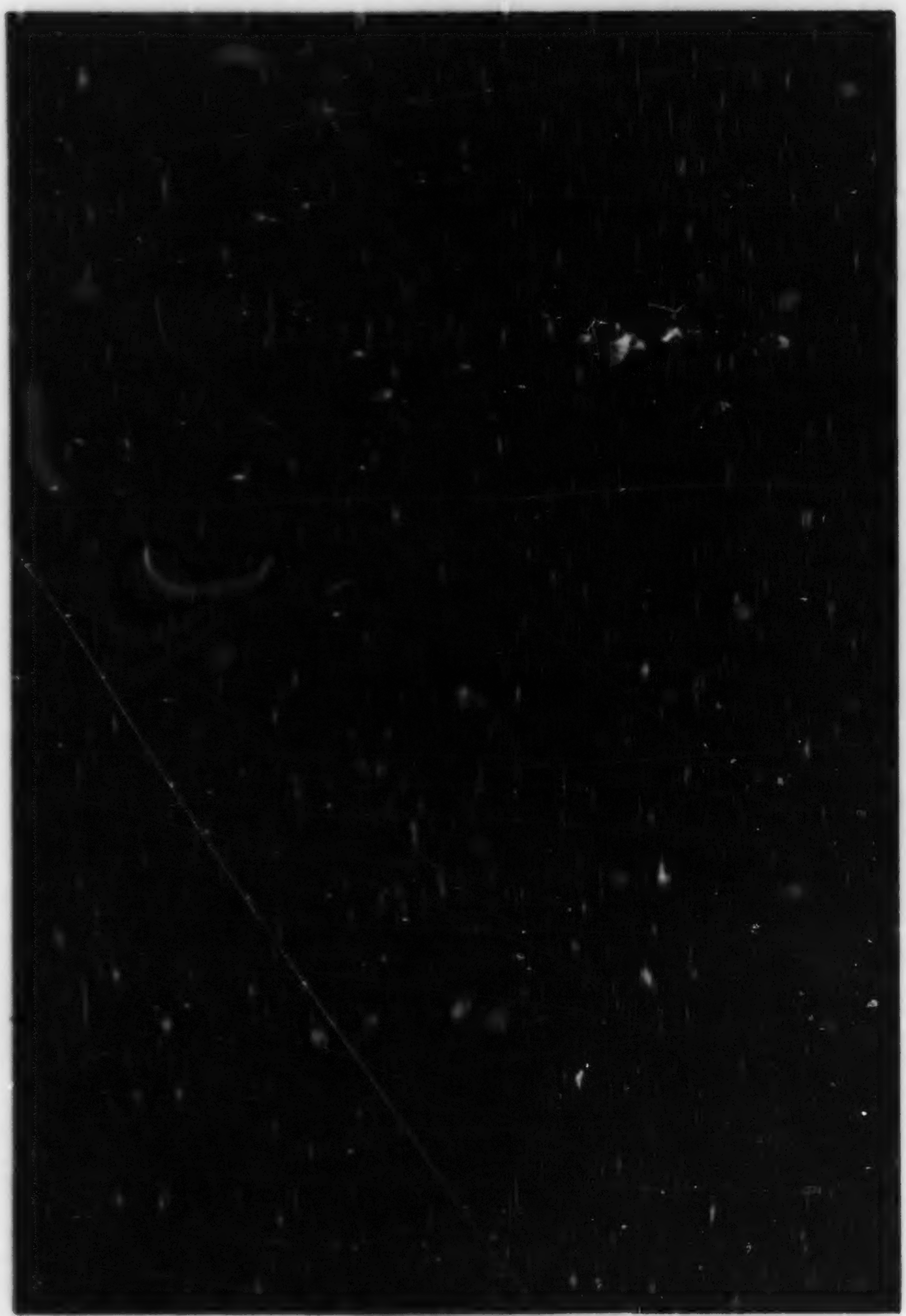
FIRST ANNUAL REPORT
EFFLUENT STANDARDS AND WATER QUALITY INFORMATION ADVISORY COMMITTEE

March 2 1973- March 1, 1974

PART II



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ANNUAL REPORT
OF
ACTIVITIES
OF THE
EFFLUENT STANDARDS AND WATER QUALITY INFORMATION ADVISORY COMMITTEE

PART II

WORKING PAPERS OF ES&WQIAC

THE

ENVIRONMENTAL PROTECTION AGENCY

WASHINGTON, D.C.

MARCH 2, 1973 to MARCH 1, 1974

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FOREWORD

This is the first annual report of the Effluent Standards and Water Quality Information Advisory Committee (ES&WQIAC) to the Administrator of EPA.

The ES&WQIAC was established as a statutory Advisory Committee under PL 92-500 to provide, assess, and evaluate scientific and technical information on effluent standards and limitations. This report summarizes the legislative basis and operations of the Committee for the period March 2, 1973 to March 1, 1974. The report consists of two parts, bound separately.

The first chapter of Part I of the report describes the legislative basis of the Committee, its structure, and its operations. Subsequent chapters provide an overview of the Committee's activities and results achieved.

Part II of the report includes the detailed comments provided by the Committee during the process of development of effluent limitations by EPA.

Martha Sager

Dr. Martha Sager, Chairman

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ESWQIAC

COMMENTS ON EFFLUENT LIMITATION DOCUMENTS

BY

INDUSTRIAL CATEGORIES

ASBESTOS

January 8, 1974
1:00 P.M.

MEMORANDUM

SUBJECT: Asbestos Manufacturing

FROM : Effluent Standards and Water Quality Information Advisory Committee

TO : EPA Asbestos Discussion Group

Prior review of the proposed guidelines resulted in the preparation of questions (see attached) that were presented to the EPA in typed form along with suggestions for the consideration of the group.

Comments by EPA on Questions

1. It was stated that the available data did not show that there is a fixed relation between maximum and average values.

2. If "no discharge" can be attained in 1977, it should be required, at least so believes the Guidelines Div.

3. No flow figures appear in the proposed guidelines and the EPA contention is that all guidelines must be accompanied by a Development Document. There is some hope that the guidelines will, at least, plainly refer to the Development Documents which will provide information on waste flows.

4. The data was said to show that the TSS and BOD values should be the same for this industry .

5. The examples using several flow rates and the resulting changes in mg/1 did not seem to impress the EPA with the need for flow data.

6. Raw waste loads can only be learned by reading the Development Document.

7. The indicated need for knowledge of the concentrations of constituents in effluents is not appreciated by the Effluent Guidelines Div.

8. It was indicated that it is necessary to use both a guideline and a development document in writing a permit. Complications in printing seem to prohibit the preparation of one volume for use in the preparation of permits.

9. No limit on asbestos fiber in effluents is mentioned in the guidelines because there is no data available.

January 8, 1974

MEMORANDUM

SUBJECT: Asbestos

FROM : Effluent Standards and Water Quality information Advisory Committee Represented by Don Bloodgood and Dr. Martha Sager

TO : EPA Asbestos Discussion Group

Questions

1. Why are the ratios between max. and avg. not all the same?
2. Why is there a requirement of zero discharge from production of asbestos millboard in 1977?
3. Why are there no indications of flow so that effluent concentrations can be specualted?
4. Is it reasonable to have a requirement for TSS and BOD the same?
5. See next page for computations.
6. What are the raw waste loads?
7. What are the speculated concentrations in the discharges?
8. Guidelines needed to direct control agencies.
9. What about a limit on asbestos fiber discharge?

Suggestions

1. Give an indication for the relation between maximum and average values.
2. Do not have a zero discharge for any category in 1977.

3. Give some indication of flow and raw waste load for all categories.
4. Explain why the TSS and BOD limiting values are the same.
5. Give speculated concentrations in effluents.
6. Make sure that guidelines are usable to control agency engineers.
7. Consider a limit on asbestos fiber discharges.

Computations

Million gallons/ton X 8.34 X X = 1.10 #s TSS ton asbestos paper, elastomeric

	mg/1 of X =	
	20	6595 gal/ton
.131189	30	4396
.1319	40	3297
	50	2638

These calculations demonstrate the varying amounts of water used in production of one ton of asbestos paper, Elastomeric, by varying the allowable pounds of TSS in the effluent.

BEET SUGAR

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE BEET SUGAR INDUSTRY

General

The Effluent Standards and Water Quality Information Advisory Committee, after an evaluation of the report prepared by the Effluent Guidelines Division, EPA; the data available and the input obtained during two workshops held with representatives of the industry and interested persons, reaches certain conclusions:

1. The Committee considers that there has been a genuine effort on the part of the beet sugar industry in the United States to adopt measures that have resulted in a notable reduction in pollution constituents of their industrial operations.
2. The industry has recognized its responsibility for pollution control and has established programs that have substantially reduced the environmental impact in the areas in and around the beet sugar mill operations.
3. The Committee has concluded that the document under discussion needs a moderate amount of editing and modification in certain respects.

The Committee presents the following comments and recommendations. These follow the outline in the RFP given to the contractor.

Industry Categorization

It is suggested that the categorization used in the draft report be modified in accordance with two classifications;

(1) Category A - for warm climates with extensive land available, and (2) Category B - for semi-moderate to cold climate and semi-arid regions. The suggested categorization is as follows:

Category A - Warm climates with extensive land - zero discharge Arizona and California, excluding Imperial Valley, Calif.

Category B - Semi-moderate to cold climate - semi-arid regions Colorado, Idaho, Oregon, Nebraska, Montana, Kansas, Texas, Washington, Wyoming, Minnesota, Michigan, N. Dakota, Ohio.

Plants built after 1950 - zero discharge

Plants built before 1950 - 0.7 lb. per ton BS

Pollution Parameters

It is recommended that no parameter be included for chemical oxygen demand, as there are no toxic ions or constituents that might affect the BOD tests, and that the standards for alkalinity not be included, as this latter depends on the alkalinity of the raw water being used rather than the constituents gained in the process in the case of a once-through system.

Control and Treatment Technologies

The industry has recognized its responsibility for pollution control and has established programs that have substantially reduced the environmental impact in the areas in and around the beet sugar mill operations. This has been made possible by process changes, reuse of water and wastewaters, additional equipment, improved entrainment separators, as well as other equipment, inplant water reduction, and improved waste management techniques.

The reductions in waste discharge that the beet sugar industry has attained have resulted from the necessity to comply with stricter water pollution control agencies. In some cases, it has been economically feasible to use some of the wastes for catte-feed, irrigation, and other uses.

Although there are 12 out of 56 beet sugar plants that practice complete recycling of wastes, thereby, attaining zero discharge, the Committee considers that this has been possible because of particular geographic and climatic situations. The other plants do not fall into the same category because of location, climate, land limitations and economic considerations. To apply a standard of zero discharge to the whole industry before 1985 as recommended in the draft report, is inequitable.

Cost, Energy and Non-Water Quality Aspects

The Committee considers that the cost for the elimination of all the waste sources cannot be justified economically if the barometric condenser waters are included. The cost of eliminating the condensing waters to achieve zero discharge is estimated as close to $320.000 for a 3,600 tons of beet sugar plant operating for 150 days during the season, exclusive of land costs and blowdown requirements. This will add at least another $400,000 to the additional cost because of land use and other considerations.

The costs for application of the several technological steps are indicated in Table 1. It should be noted in Table 1 that the reduction already attained has been reached at a cost of about $4-5 million, including land costs, for the reduction of 71% of the total organic load (excluding the lime-holding pond). The reduction of 0.7 lb. per ton of beets sliced, corresponding to 2% reduction of the total load, takes an exponential rise as shown in Table I when the barometric condenser waters are required to be eliminated.

Beet sugar processing cannot be considered to be a highly profitable business. At least 10% of the existing plants are said to be considering closing because of financial difficulties, even without the financial burdens that will result from the implementation of the zero discharge concept or restrictive environmental regulations. Others will be seriously jeopardized if the zero concept is spread to all of the industry.

Best Practicable Technology (BPT)

The Committee considers that the BPT at this time should be zero discharge for some categorization based on availability of land, costs, climate and other considerations; while for another categorization, the limit recommended should be 0.67 lb. per ton of beet sliced, which corresponds to the once-through use of the condenser water. This is based on a BOD of 40 mg/1 for a flow of 2,000 gals. per ton of beet sliced. This would mean that for the appropriate category the effluent requirement would be as given in Table II.

TABLE I

COST OF APPLICATION OF TECHNOLOGIES

EPA Estimates

Source	Cost of Application Million of $	Commulative Cost Million of $	% BOD_5 Reduction
Red. in Flume			
Pulp drying			
Screening			
Lime Dosifier			
Holding Ponds			
Sludge Removal			
Cooling	3.76		
Lime Pond	0.05	3.81	87.0
Red. in Flume	0.31	4.12	91.2
with Screening	0.23	4.35	
Condenser Waters	0.32•	4.67	100.0

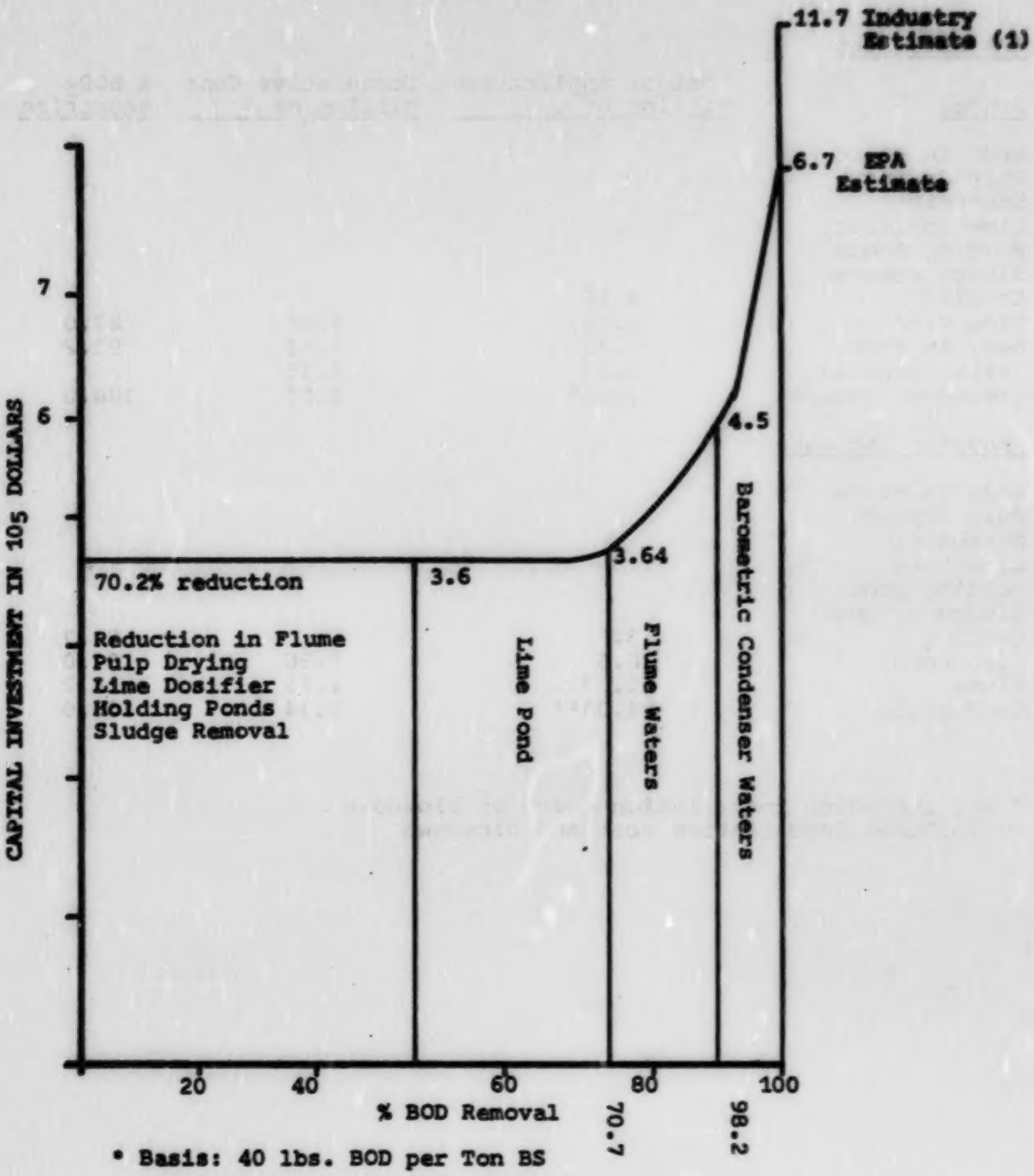
Industry Estimate

Source	Cost of Application Million of $	Commulative Cost Million of $	% BOD_5 Reduction
Red. in Flume			
Pulp Drying			
Screening			
Lime Dose			
Holding Pond			
Sludge Removal			
Cooling	3.8		70.7
Lime Pond	0.6	3.86	87.0
Flume	1.27	4.13	98.2
Condensate	1.01••	5.14	100.0

• Not including installation costs or blowdown

•• Includes installation cost and blowdown

TABLE I(A)
COST ESTIMATES TO ATTAIN BPT AND BAT PROPOSED TECHNOLOGIES



* Basis: 40 lbs. BOD per Ton BS

(1) Includes extra land costs

(2) Not including extra land costs

COS

TABLE II

SUGGESTED STANDARDS FOR BEST PRACTICABLE TECHNOLOGY

1977

Constituent	Concentration in mq/1	Lb. per ton Beet Sliced
Biochemical Oxyden Demand	40	0.67
Suspended Solids	40	0.67
Ammonia (as N)	15	0.25
Phosphorus (as P)	0.1	0.002
PH	6.0 - 9.0	--

BEST AVAILABLE TECHNOLOGY

The Committee agrees that in some areas the best available technology will dictate zero discharge, while in other situations, it may be necessary for the industry through more refined operation procedures, to reach a degree of treatment as indicated in Table III. The limit suggested for BOD for BAT in this categorization depends on the development of better entrainment apparatus that would permit a higher degree of efficiency by reducing the sugars going into the barometric condenser waters.

TABLE III

SUGGESTED STANDARDS FOR BEST AVAILABLE TECHNOLOGY

1983

Constituent	Concentration in mg/1	Lb. per ton Beet Sliced
Biochemical Oxyden Demand	25	0.42
Suspended Solids	25	0.42
Ammonia (as N)	10	0.17
Phosphorus (as P)	0.1	0.002
PH	6.0 - 9.0	--

In 1985 the concept of zero discharge should be attained.

New Source Performance Standards and Pre-Treatment Standards

It is agreed that the new source standards should meet the BAT for 1983. The section on New Source Performance Standards should place more stress on site selection for new plants.

BUILDING PAPER

BUILDING BOARD

ES & WQIAC REPORT ON DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES

Harboard Industry

General

Data Base - Although the report mentions (page 11), the "various sources" of data, no explicit information is given with respect to the actual data base in terms of number of plants sampled over what period of time with what frequency and by what procedure. Thus the explicit method for developing the information is not defined. Possibly the approach may have been to develop materials-energy balances for the different subcategories of the industry based on the range of data sources mentioned. But if so, this is not made explicit.

Industry Categorization

The categorization of the industry appears inadequate. Using the criterion of significant difference in raw waste load generated, it appears that the four categories suggested by the Hardboard Ad Hoc Committee would probably be more appropriate, i.e.: dry; wet-wet; wet-dry; and dry-wet. The statement in the contractor's report on page 74 that the character of the product does not have any significant impact on raw waste load does not seem to be correct. Further, the contractor states, "similar products can be produced by a combination of different in-plant processes" (page 74).

However, the industry states that only certain kids of products are typically or can be produced by certain processes. For example, the dry process can be used to produce both S1S and S2S hardboard, but the wet-wet and dry-wet processes are used to produce only S1S and the wet-dry process is used to produce only S2S.

It appears that raw material may also have a substantial impact on raw waste load generation per unit of output, as pointed out in the statement by the Hardboard Ad Hoc Advisory Committee (pages 13-15). The characteristics of the wood specie may also have a major impact on the extent to which recycling of water and recycling of fiber is possible, given the same production process.

Sufficient data has not been presented by either the contractor nor the industry committee to define conclusively the categorization for the industry. However, there appears to be more data relating towards the industry presentation than in the body of the contractor's report.

As the contractor points out, and the industry committee corroborated, one of the important aspects of the industry is the fact that it used materials, i.e., wood products residues, which otherwise would probably become a solid residuals problem. In addition, as the demand for higher quality wood for saw timber, veneer, and plywood increases, and the demand for wood products residues for pulp and paper manufacture increases, the quality of raw material available to produce hardwood board may well decrease. Lower quality wood residues and previously unused species may become larger proportions of the raw material base for the industry. This may well exacerbate the effect of raw material on RWL generation.

The Industry is willing to develop additional data particularly with respect to:

a. RWL for S2S plants, a category essentially ignored by the contractor. There are 9 plants using the process-product combination involved.

b. An attempt will be made to assess at least in qualitative fashion the effects of technological change over the next ten years on RWL. These would include the possible changes in proportion of low quality raw material, possible changes in product output, and possible changes in production processes. It appears that trends are such that it is very likely the RWL will be increased per ton over this period.

RWL Characterization

1. The basic parameters selected to characterize the raw waste load of the industry are appropriate. Exceptions might be phosphorous and nitrogen. No data are presented on the quantity of waste heat generated and/or discharged per unit of product by different processes used in the industry.

2. The use of the terms "gains" and "losses" in the water balances, such as in Figure 16 on page 114, is pecular and

unusual. The term loss is generally reserved for consumptive use or evaporation of water in a process. The water balance -- and materials and energy balances -- normally are characterized in terms of inflows and outflows, i.e., in and out, along with recirculation flows.

3. Inadequate attention has been given in the contractor's report to the problem of liquid raw waste load associated with fire protection. Apparently this can be a significant factor in at least dry process plants. It is not clear the extent to which raw waste loads from fire protection activities contain BOD and suspended solids. However, the quantity of water involved in this use is apparently not insignificant in relation to water use for all other activities and processes in the hardboard production process, at least for the dry process. (See the statement by the Hardboard Ad Hoc Committee and the data submitted with the letter to Sager of 19 June.)

4. The contractor in analyzing this industry has failed almost completely to analyze the effects of raw material on raw waste load and the effects of changing raw material and changing product mix on RWL. For example, the quantity of bark which can be used is a function of the product to be produced and the process of production utilized. RWL is also affected by the extent to which bark can be used directly in the product and for by-product production.

5. More use of bark will increase the amount of fines in the system, some of which will not be incorporated in the product and will be found in the RWL. This will tend to increase RWL per ton, all other factors being the same.

6. The industry has been relatively volatile, particularly in terms of development of final products. Currently there are three major products: S1S-exterior; S1S-interior; and S2S. About 40% of the production in the industry is S1S-exterior. But the most recent product is the medium density product, which is undergoing a very rapid expansion.

The S2S is made mostly from hardwood and very little bark can be used in its production. On the other hand S1S-interior can be made with both hardwood and softwood, and can use substantial quantities of bark. Thus, if the trend in the industry is toward a higher proportion of S2S, there will be less ability to use bark.

Another changing aspect of final product is the virtual extinction of production of flat panels. Most of the hardboard now, at least interior hardboard, is embossed, which requires thicker board, and may mean more RWL per ton.

7. There are shifts in processing under way, regardless of pollution controls. For example, the use of "guns" (explosion process) is decreasing, because of lower efficiency, i.e., lower yield with that process. Shifting to refiners will result in a different liquid effluent, higher RWL per ton.

This will increase the amount to the evaporator, despite higher yield. In effect, what had volatilized into the atmosphere now will instead come out in the liquid residual.

On the other hand, the refining process enables more use of lower quality raw material, such as bark and limbs, for the same product mix. Shifting from guns to refining results in lower concentration of RWL, as well as a change in quality. This means a higher load on the evaporators. In turn, this means more fuel is required to accomplish the evaporation process. In some cases this may mean a difficult problem of meeting air quality standards.

Another process change which has important implications is in the coating process. The dominant procedure at present is the use of solvent-based coatings. Because of restrictions relating to air quality, the shift is to liquid-based coatings. This will increase the RWL per ton.

RWL Removal Methods and Costs

1. It appears that in-plant control technology has been assessed reasonably well. However, the extent to which the type of product produced and type of process affects the degree of water recirculation possible is not explicitly analyzed. In addition, to the extent that evaporation is proposed as a control measure, any limitations in relation to wood species-production process-product output are not analyzed.

2. Detailed analysis of discharge reduction costs, to different degrees of removal, are presented in Section VIII of the report and in considerable detail in Supplement A. This is one of the best aspects of the report, in that it shows clearly the increase in costs associated with the increase in degree of removal. The only unfortunate aspect of the presentation in Supplement A and in the report, is the failure to include the total cost-reduction curves in the test of the contractor's report itself.

3. A few questions can be raised about the assumptions used in the cost calculations. For example, on page 5, the annual interest rate on capital investment used is 8%. This is certainly too low under present (1973) conditions; it should be on the order of 12 or 13 percent. In the alternatives utilizing ponds, no explicit item is included for land costs. This is probably relatively unimportant in connection with ponds, because only about 10,000 square feet in area are involved. However, for alternative E-1, spray irrigation, the amount of land required would likely be substantially larger than for a simple pond. Consequently, the assumption about land cost should be explicitly indicated.

4. The presentation of the material on costs is inadequate. There should be explicit labeling of each curve, i.e., refers to a plant of a particular size, i.e., output, raw material, production process, the year to which the costs refer, i.e.,

1973 or 1972 or 1970, and the interest rate used in computing the costs and the specific cost components.

BPT/BAT

1. The proposal for zero discharge for dry process hardboard seems reasonable, with the possible exception of the assumption that land will be available for disposal of caul wash water. There may be some instances, as in the case of any other industry where land disposal is assumed, that land is physically unavailable or that the climate precludes sufficient net evaporation.

2. The proposed BPT for wet process mills likewise seems to be reasonable, again with the possible exception of the problem of land availability. However, as noted above, additional categories should probably be developed.

3. BAT for the dry process segment of the industry is essentially the same as for BPT, zero discharge. The same caveat holds as with respect to the comment above on BPT.

4. To achieve the BAT proposed for the wet segment of the industry may well be difficult for some segments of the industry, depending on the quality of raw material and the type of product produced.

5. The Laurel, Mississippi plant of Masonite Corporation meets the suggested BPT discharge limitation about 60% of the time. It does so only because it is able with its process

to concentrate the effluent by evaporation and to use the residual as a mix in animal feed. This is not possible for all plants. And even with the extent of residuals handling in the Laurel plant, the plant does not meet the standards a substantial portion of the time. Yet, this plant was termed an exemplary plant by the contractor.

Energy and Non-Water Effects

1. The potential problem of sludge disposal is mentioned, but no quantities of additional sludge generated at each level of removal are presented.
2. No data on additional energy requirements at each degree of removal are presented.

Allowance for Variability

No data are presented on variation in RWL generation. Cursory discussion is presented on pages 185-189 of variation in effluent quality. These data indicate substantial variation in final effluent, but reasons for such variation are not indicated. The types of mills represented in Figures 35 to 37 are not indicated. But the data presented show that for Mill No. 2 (Figure 35), the montly variation -- which is likely to be substantially less than the daily variation -- shows a range of about 2.5 to 1 for BOD (kilograms per ton). This contracts with the range for Mill No. 3, in Figure 36, of about 5 to 1 (kilograms per ton), but a a much lower level of absolute generation, i.e., a mean of perhaps 3 kilograms per ton for the latter compared with around 15 for the former. Mill No. 4, Figure 37, seems to be more similar in terms of both variation and mean RWL generation to Mill No. 2 than to Mill No. 3.

Clearly the discussion of variability is not adequate. No recommendation is made as to how such variation should be considered in promulgating the guidelines.

INDUSTRY INPUT

TIMBER PROCESSING

American Hardboard Assoc.
Chicago, Ill.
Ltr. 6/19/73 w/comments re:
industry and requests meeting w/Comm.
submitted tech. info. on hardboard mfg.

American Hardboard Assoc.
Chicago, Ill.
Ltr. 7/17/73 re: notification acknowledgement
for industry meeting 7/24/73 in CM

Koppers Co., Inc.
Pittsburgh, Penna.
Ltr. 7/23/73 re: draft dev. document
on industry w/comments

Hardboard Ad Hoc Advisory Comm.
report on draft dev. document-
comments, and recommendations

Abitibi Corp.
Alpena, Mich.
Ltr. to B. Bower re: input for
operating plant for review by
Committee and ref. to industry
meeting at CM#2 7/24/73

CANE SUGAR

PROPOSED ES&WQIAC FINAL REPORT ON CANE SUGAR PROCESSING INDUSTRY

CONTRACTOR: Environmental Science & Engineering, Inc.
July 1973

PART I - Raw Cane Sugar

GENERAL:

The report provides a description of the technologies of cane sugar processing industry raw sugar SIC 2061 and refining SIC 2062. The description is not expert but adequate for the purpose of this study. Source of the data on analysis, however, appear misleading in some instances. In the opinion of ES&WQIAC, they do not follow actual in-plant operation.

Treatment Possibilities - Comments:

The Contractor indicates that "it was determined that most of the sugar factories in the U.S., Hawaii and Puerto Rico do have available land to retain wastes", adding that there are certain areas in Hawaii, Puerto Rico, Florida and Louisiana, where land is not available for impouding or lagooning. There are serious considerations as to the availability of land that must be recognized and thus in some instances, regulations must be issued on a case-by-case basis. ES&WQIAC is in agreement with the case-by-case approach in those areas where there are limitations of land and/or the cost of land is prohibitive to be used for lagooning.

BOD$_5$ In Barometric Condenser Waters:

The report indicates that the chemical composition of condenser water from the plants is highly irregular because of cyclical variations in operations. This has been the practical experience, and follows the works reported in Louisiana, Hawaii, and Puerto Rico. ES&WQIAC understands that the Contractor is correct in this appreciation, and that the variability in concentration of BOD$_5$ occurs because of the following reasons:

(1) Entrainment separators. On many occasions, the efficiency of the entrainment separators, has been found in practice to be less than what the manufacturer claims. These separators become less efficient with years of use.

(2) Evaporator or Vacuum Pan Level. In order to attain the most efficient operation, the evaporators and vacuum pans should be filled to a certain level. Even at times, the operator fills the unit, above the correct level, entrainment increases and thus, the BOD of the condenser waters goes high. This is the main reason of the high variability reported by the Contractor.

(3) Sugar particles that escape upon boiling from the evaporators and vacuum pans cause high BOD.

(4) High temperatures or defects of calandria in the vacuum pans. Tables I and II show the BOD of barometric condenser waters from the operations conducted at Hawaii, Louisiana and Puerto Rico.

It must be also considered that the introduction of the calandria type evaporator and vacuum pans in the sugar industry has allowed increase evaporation rates, but a the same time have increased the possibility of sugar entrainment in the condenser waters, as indicated in pg. 105 of the Contractor's report.

The BOD of the wastes is almost exclusively due to an organic food, sugars, and thus, the implication on environment deterioration is solely on oxygen demanded for their oxidation from the receiving waters. There is no organic chemical constituent, toxic, or bacteriological contamination associated with the discharge of this waste.

TABLE I

BOD_5 IN BAROMETRIC CONDENSER WATERS AT CANE-SUGAR PLANTS AT HAWAII, LOUISIANA AND PUERTO RICO

Contractor's Rpt.(1)	BOD5 Load Hawaii(2)	Louisiana(3)	(P.R.) Biaggi (4)	(P.R.) Guzman (5)
	(1971)	(1973)	(1968)	(1962)
mg/1	----	N/A	65-130	45-150
Lb/ton cane	0.28-2.05	1.07-7.4	0.28-9.38	0.30-5.83

Based on a percent sugar yield average of 9.5 (Table I Ref. 4), Table I, when converted from lbs BOD per ton of cane ground to lbs BOD per ton of 96° sugar produced, the BOD load on actual plant operation is as indicated in Table II.

TABLE II

BOD5 IN BAROMETRIC CONDENSER WATERS BASED ON LBS. PER TON 96° RAW SUGAR PRODUCED

Source	Lb. BOD/Ton 96° Sugar Produced
Hawaii	2.95 - 21.6
Louisiana	10.5 - 77.9
Puerto Rico (Biaggi)	2.95
Puerto Rico (Guzman)	3.2

•(1) Based on 22 plants

(2) Ref. (1)

(3) Contractor's Data

(4) Ref. (4)

(5) Ref. (22)

ES&WQIAC wishes to indicate that the only way to reduce the BOD of the condenser water is by lagooning, as other treatment will be too expensive and has no merit considering that the BOD of this waste is in terms of concentration, close to the 30 mg/1 which EPA defines as secondary treatment. There are other physical methods to reduce entrainment that must be considered.

(1) Cleaning the entrainment separators when their efficiency goes too low.

(2) Changing the direction of vapor flow and others.

Suspended Solids:

The Contractor reports suspended solids in the barometric condenser waters, and it implies that these are originated in the process. Generally, the suspended solids in these waters are almost entirely those contained in the intake waters, which are pumped to the evaporators and vacuum pans. Because of this reason, ES&WQIAC is of the opinion that suspended solids should not be a parameter in condenser waters.

Chemical Oxygen Demand:

ES&WQIAC considers that the parameter of COD should not be included for condenser waters, as there is little that could be done to reduce it. BOD should be sufficient to define the effluent limitations.

Biological Treatment:

The Contractor reports that biological treatment of sugar wastes has been demonstrated in bench and pilot works, referring to studies by Bhaskaran and Chakraborty (Ref. 11) in India. It indicates a reduction of 61.5% in BOD utilizing impounding lagoons. Studies by Guzman (Ref. 22) indicates a reduction of 92% in anaerobic lagoons. Although the studies made in India have been on a bench scale, the ones in Puerto Rico have been an actual operation. Both studies refer to the process wastes, which contain a BOD concentration of about 2,000-3,000 mg/1. Thus, the treatment of the process wastes by anaerobic lagooning should be considered as a proved technology, not as demonstrated bench scale or pilot studies technology as indicated in the Contractor's report.

Activated Sludge and Biofiltration:

The Contractor reports studies by Miller (Ref. 12), indicates the activated sludge can reduce a cane sugar waste of 800-1,000 mg/1 to about 20-40 mg/1, for a reduction of 96.0-97.6% in terms of BOD. Such a reduction, although theoretically possible, has not been attained in actual practice.

The Contractor also reports BOD reductions of 83-97% (Ref. 13,14 and 15). This refers to pilot studies which have not been proved in actual operations. The Contractor concludes, because of these studies, that if sufficient land for impoundment is not available, then the activated sludge process should allow an efflucent discharge of about 20 mg/1. As the process wastes concentration from the cane sugar industry are in the order of 2,000-3,000 mg/1, this would be equivalent to a 99% plus efficiency in BOD removal.

ES&WQIAC does not agree in this reasoning because of the following considerations:

(1) Previous difficulties in attaining good reduction values in BOD by activated sludge, as per studies made by Buck, Seifer and Jost, Consulting Engineers, New York, N.Y. These works are not included in the Contractor's references.

(2) An effluent reduction of 99% in activated sludge in a waste rich in carbohydrates is almost impossible.

(3) Apparent contractor's failure to sample the process waste.

(4) Apparent contractor's misunderstanding of the concentration of the process wastes, which he

indicates is 204 mg/1 while the correct figure is between 2 and 3,000 mg/1.

(5) Difficulty of dealing with a strictly carbohydrate waste, and the protein-sparing theory, which was not considered by the Contractor.

Protein-Sparing Reactions:

Any waste high in sucrose, and 6 carbon sugar as fructose or levulose, tend to be attached fast by the microorganisms, which will use them as food in preference to proteins and other nutrients. The microorganisms will not touch any form of protein or organic matter until it has exhausted the sugars. This results in a fast degradation of the CHO molecute and in a high production of volatile acids, which reduces the pH and eventually inhibiting their growth. For this reason, it is necessary at times to add vast amounts of alkaki (about 500-600 mg/1 of hydrated lime) to neutralize the volatile acids. These will build fast to the 2,000 mg/1 level in which the biological system tend to die. It is interesting to observe that for cane sugar wastes the pH of the waste, if lime is not added, reaches a pH of 4.7 - 4.8, ceasing the microbiological life. Due to these concepts, it has been found in pilot plant operations and in practice that the conventional activated sludge process have many limitations to treat any wastes high in sugars. ES&WQIAC considers that EPA should not set a standard that will require industry to spend funds in activated sludge plants at this time, since there is the possibility that the conventional plants of this type will not work for this particular waste. Besides, it is not a proved technology for this type of waste.

Pilot studies have been made which indicates that the activated sludge process has not proved effective for the treatment of cane sugar process wastes, (Buck, Seifer and Jost, N.Y.). However, anaerobic lagooning is a proven technology that should be used where land is available at a reasonable cost. ES&WQIAC also considers that in such cases the regulations should be on a case-by-case basis rather than ask for a 20 mg/1 effluent.

Alternatives for Wastewater Treatment:

Alternative B: The Contractor defines Alternative B as the elimination of the filter's mud discharge and makes an estimate of $83,000 on construction cost for a 3,000 ton a day plant. The elimination of the filter mud is standard practice throughout the industry; furthermore, it is recovered as fertilizer for the growth of cane. ES&WQIAC considers that for these reasons, this should not be reflected in the cost estimate, thus, Alternative B should be eliminated.

Alternative C: The Contractor includes the use of entrainment separators and Alternative C, and adds an investment cost of $90,800. Although the separators prevent high build-up of BOD in the condenser water, its use in the sugar house deals with its chemical engineering aspects rather than the environmental ones. The entrainment separators main use is to prevent the loss of sugar. ES&WQIAC considers that Alternative C should not be included as a pollution control device and thus, should be eliminated from the cost estimate. This allows, in the opinion of ES&WQIAC, for the elimination of Alternatives A, B and C, as recommended by the Contractor. Cost estimates for the three alternatives, $173,000,should be zero.

Alternative D: The Contractor recommends the impoundment of all the wastewaters except for the condenser water, this resulting in a BOD and suspended solids load of 0.47 lbs per ton of cane sugar grinded.

Contractor's Calculations for Alternative D:

Given: 53,000 cu m per day for a 3,000 ton a day plant

14.0 mgd for a 3,000 ton plant

BOD: 0.47 lb per ton

$$\frac{14.0 \text{ mgd}}{3{,}000 \text{ tons}} = 0.0047 \text{ m.g./ton of cane}$$

$$0.0047 \times 8.34\ (x) = 0.47$$

$$x = \frac{0.47}{0.0047 \times 8.34} = 12 \text{ mg/1 BOD in condenser waters}$$

ES& WQIAC considers that the limitation of 12 mg/1 BOD for the condenser waters is too low, and is not in agreement with the data obtained by the Contractor in the plant surveyed nor in actual plant operation as reported in References (1), (4) and (22).

ES&WQIAC Calculations and Recommendations:

A. Barometric Condenser Waters

mg/1 condenser waters based on Table 20 (Contractor's report), 22 plants surveyed.

BOD in Condenser Water (from Table I ES&WQIAC)

Table 20 - Contractor's Report	67
Ref. 4	65
Ref. 22	45
ES&WQIAC figure for BOD, as could be attained based on actual practice in exemplary plants	45

Flow: 14 mgd for a 3,000 ton plant

14/3,000 = 0.0047 m.g./ton cane

0.0047 x 8.34 x 45 = 1.76 lb BOD per ton cane grinded

% sugar yield based on Ref. (4): 9.5

1,000 lbs 96% sucrose need 10,526 lbs cane sugar

10,526/2,000 = 5.26 tons cane to produce 1,000 lbs sugar

5.26 x 1.76 = 9.25 lb BOD_5 per 1,000 lbs. of 96° sugar for the barometric condenser waters (ES&WQIAC Recommendation)

B. Filter Press: Zero Discharge

C. Process Waste: Impoundment where land is available, and discharge upon reduction of not less than 90% in BOD if percolation and evaporation is not satisfactory.

D. Cleaning Wastes: Separate impoundment

Alternative E: Total impoundment of the condenser wastes is not considered as BPT, as it will result in a zero discharge. Although some plants in Louisiana and Florida are attaining this concept at this time, this is much more dependent upon land costs, as the Contractor indicates on pg. 47.

Alternative F: Alternative F calls for activated sludge. Since this has not been proven in actual plant operation for the cane sugar industry and the literature as to its efficiency in this type of waste is conflicting, it should not be considered at this time for application.

Comparison of Suggested ES&WQIAC Number and Plant Operation Data:

Based on the calculations made, ES&WQIAC recommends the figure of 1.76 lbs per ton of cane sugar grinded. Based on a 9.5% yield, the figure is equivalent to 9.25 lbs BOD5 per 1,000 of 96° sugar produced. The 9.5 yield takes into consideration the sugar lost by inversion to molasses, filter cake, bagasse and undetermined losses. Table III shows the results of operational data from 19 plants, (based on Ref. 4) as compared to the Contractor's findings (Table 20).

TABLE III

CONDENSER WATERS-BOD IN ACTUAL OPERATIONS- LBS PER TON OF CANE GRINDED

Factory	Based on Ref. (4)	Fact.	Based on Table 20
A	2.47	A	0.26
B	0.80	B	1.10
C	1.28	C	6.00
D	1.73	D	0.96
E	0.28	E	2.40
F	3.41	F	4.60
G	4.72	G	1.58
H	--	H	1.74
I	1.27	I	2.40
J	2.65	J	1.28
K	--	K	1.74
L	5,14	L	0.28
M	4.91	M	3.40
N	2.23	N	2.80
O	9,38	O	2.2
P	1.33	P	1.28
Q	--	Q	0.56
		R	7.50
		S	0.56
		T	0.18
		U	1.88
		V	0.40
Arithmetic Ave	2.97		2.05
Median	2.40		1.68

Contractor's Data:

It is noticed in the Contractor's report that no data is included in the process wastes. Table 25 shows that the effluent waste load for the industry is 204 mg/1. This figure does not appear correct. It is the practice of the cane sugar industry to separate the condenser and process waste, as the latter must be disposed by lagooning. The figure of 204 mg/1 for the effluent waste load is too low for the process waste (should be 2,000-3,000 mg/1), and too high for the barometric condenser waters. It is suggested that this data be revised by the Contractor before the final draft of the report is prepared.

No information is included in the report as to the cleaning wastes. This is done about once a week for the heat exchangers, and about once a grinding season for the clarifiers and other equipment. Consideration should be given to the fact that the wastes from the cleaning of clarifiers may have a BOD as high as 50,000 mg/1 and must be disposed of in a separate lagoon.

ES&WQIAC Recommendations for Industry Categorization:

Category A: Based on land availability with considerations as to cost.

Category B: Based on case by case basis when land is limited and/or costs are too high. Some cases in Hawaii, Puerto Rico, Louisiana and Florida.

Category C: Based on climatological considerations - some areas in Hawaii.

ES&WQIAC Recommended Guidelines for Category A:

BOD: 9.25 lbs per 1,000 lbs of 96° sugar produced

Suspended Solids: 9.25 lbs per 1,000 96° sugar produced

COD: No regulation

pH: 6.0 - 9.0

Fecal Coliforms: No regulation

Category B and C:

Approved discharge as determined by the Regional Administrator on a case-by-case basis.

ES&WQIAC COMMENTS ON THE DEVELOPMENT DOCUMENT FOR PROPOSED EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE CANE SUGAR REFINING SEGMENT OF THE CANE SUGAR PROCESSING-POINT SOURCE CATEGORY

ES&WQIAC has reviewed the subject document and wishes to make the following comments and recommendations:

1. The suggested technology cannot be considered BPT, since it is not a proven technology and has never been utilized in actual practice in this country.

2. The only and more economical proved technology for the sugar wastes is the use of lagoons. A well-operated lagoon can attain a reduction of about 90% BOD, provided that a series of lagoons are constructed and one is used exclusively for the cleaning of the units of operation of the sugar house.

3. There are studies conducted by Miller, Baskaran and Simpson and Hemans (all made in foreign countries) which indicates that the activated sludge process can result in an effluent of 2040 mg/1 for a reduction of not less than 95%, but has not been proved in actual plant operation in the United States nor in any other country.

4. ES&WQIAC considered that it would be unfair to ask industry to build activated sludge plants when this is not a proven technology, and no one can assure that it will attain the expected reduction. Design criteria for this type of waste is practically non-existent.

ES&WQIAC considers that the effluent limitation for BPT should be based on practical proved technology for the sugar wastes, not on laboratory work performed in other countries.

5. The suggested standard limitation of 0.16 lb BOD_5 per ton of malt is based on 0.67 lb BOD_5 for the barometric condenser waters plus 0.09 lbs for the process wastes. The data gathered by the Contractor and submitted by Industry tend to indicate that in many cases it is possible to attain the 0.67 lbs in the barometric condenser waters. This is based on a concentration of 12 mg/1 BOD for these waters. Although about half of the factories surveyed generate waters with BOD above the 12 mg/1 limit; a level of 14 mg/1 is suggested for the barometric waters. The sugar melt must have to be maintained at a relatively low level below the calandria at the evaporation and vacuum units.

6. The limit of 0.09 mg/1 for the process waste is based on a 600 mg/1 BOD_5 and a reduction of 95% and over to attain 30 mg/1 in the effluent. It is considered that the allowance for the process waste is too restrictive and that industry will have great difficulty in attaining it. EPA expects that the activated sludge process will result in the reduction of 95%. It is considered that it will be very difficult or may be impossible to attain this reduction with the existing technology because of:

(a) Difficulty in dealing with a strict sugar waste. The fast utilization of this molecule results in a high production of volatile acids which makes the opration very difficult.

(b) Difficulty in growing the activated sludge in this strict sugar waste even when nutrients are added.

(c) Negligible buffer capacity to compensate for the fast generation of volatile acids.

Therefore, based on the above consideration, ES&WQIAC recommends that the effluent limitation applied to Best Practicable Technology Currently Available which must be achieved by existing point source by July 1, 1977 for Cane Sugar Refining be:

Crystalline or Liquid Cane Sugar Refineries

BOD_5	1.0 lb/ton of melt
SS	0.20 lb/ton of melt

Basis for the Recommendation

0.80 lb/ton of melt BOD

0.18 lb/ton (Based on 90% reduction by lagooning or other method selected by Industry)

0.98 lb/ton

1.0 lb/ton (round figure)

This recommendation is also based on the RWL as indicated in the Contractor's report, 14 mg/1 BOD of the barometric condenser waters and 600 mg/1 BOD in the process waste.

CANE SUGAR

Honokaa Sugar Co.
Honolulu, Hawaii
Ltr 7/25/73 re:
effl. limitations for
Hilo-Hamakua Coast of
Hawaii (island and
recommendations

Laupahoehoe Sugar Co.
Honolulu, Hawaii
Ltr. 7/25/73 re:
eff. limitations for
Hilo-Hamakua Cost and
recommendations

Statement

Commonwealth of P.R.
Dept. of Agriculture
by Jose R. Goitia
presented at 4/30/73
meeting, Purdue Univ.
Public Hearing

Theo. H. Davis & Co. Ltd.
Honolulu, Hawaii
Ltr. 6/6/73 re: poll. abatement
in Hil-Hamakue Coast-attachment-
"Evaluation of Mill Waste Water"
report by: Britex Hawaii

Report: Hawaiian Sugar Planters' Assoc.
1970 Annual Report- (maps, photographs included)

Statement

Theo. H. Davies Co.
Honolulu, Hawaii
by: John Bersch- presented at
5/25/73 Public Hearing at Crystal City
Holiday Inn

Statement

Hilo Coast Processing Coast
by: Richard T. Webb--presented
at 5/25/73 Public Hearing at Holiday Inn
Old Angus Ballroom

U.S. Cane Sugar Refiners' Assoc.
Washington, D.C.
Ltr. 8/7/73 encl. "Technical Analysis
& Comments" re: draft dev. document

January 18, 1974
11:00 A.M.

MEMORANDUM

SUBJECT : Cane Sugar

FROM : Effluent Standards and Water Quality Information Advisory Committee Represented by Ramon Guzman

TO : EPA Cane Sugar Discussion Group

Comments on Questions (Statement made by R. Guzman)

1. It was pointed out that the data in Table I of the Proposed Guidelines is not unlike that requested on flows for most of the other industries.
2. Changes have been made in the form of presentation in the Federal Register.
3. Subpart A of the guideline is for Beet Sugar and it is not being promulgated at this time.
4. The limits are established on tons instead of $1000^{\#}$s because the industry uses tons in measuring their production.

Additional Input:

The guidelines are being prepared at this time for crystalline and liquid cane sugar.

A considerable amount of information has recently been obtained from the industry.

The economics are a problem. There may be 3 to 5 refineries that are put out of business. Three of the refineries are in Puerto Rico and they involve as many as 2000 persons. (Statements made by L. Smith and R. Guzman)

DAIRY PRODUCTS

ES&WQIAC REPORT ON DRAFT DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE DAIRY PRODUCTS INDUSTRY

General

The Dairy Products Industry, Draft Guidelines, has been reviewed. It has been compiled in the usual order.

There are some fundamental factors involved that are perplexing.

The industry comment letters have been received and contents noted.

Industry Categorization

The Contractor lists the following subcategories:

1. Receiving Station
2. Fluid Products
3. Cultured Products
4. Butter
5. Natural and Processed Cheese
6. Cottage Cheese
7. Ice Cream, Frozen Desserts, Novelties and other Dair Desserts
8. Ice Cream Mix
9. Condensed Milk
10. Dry Milk
11. Condensed Whey
12. Dry Whey

The listing is our way of considering the variability in the processing of dairy products.

Waste Characteristics

The characteristics of the wastes are to be evaluated by: BOD, COD, Suspended Solids, pH, temperature, phosphate, chloride and nitrogen.

Reproduced from best available copy.

To determine BOD_5 (or M.E.) for a product with a fat or solids content other than that indicated, extrapolated or interpolated as necessary using the values in the "Draft".

BOD_5 (ppm) = (% nonfat solids X 100) + (% Fat Solids X 8600).

M.E. = % fat (mat'l) X % fat + (Mat'l)
% fat (Milk)
% Total Milk Solids (Mat'l)
% Nonfat (Mat'l X % Nonfat (Mat'l)
% Nonfat (Milk)
% Total Milk Solids (Mat'l)

BOD_5 (ppm) = (% Nonfat X 6300) + (% Fat X 8600)

End-of-Pipe Control Technology

Activated Sludge	Stabilization Ponds
Trickling Filters	Disposal on Hand
Aerated Lagoons	Combined Systems

The attached Table from the "Draft Report" appears to be the basis for the recommended treatments for BPT and BAT.

Cost, Energy and Non-Water Quality Aspects

Supplement "A" was obtained and it gives capital cost (Model Estimate) for the several systems at four raw waste concentrations and four flows. Concentrations: 500; 1000; 1500; and 2000 mg/1 and flows: 50,000; 100,000; 250,000; and 500,000 gpd. Operating costs for the several systems when handling 2,000 mg/1 waste at four different flows.

Costs for operation for all systems (including depreciation) vary from $.40 to $4.32 per 1,000 gal.

Best Practical Treatment

The guidelines has the following to say about BPT: "-------- it has been estimated that the degree of BOD_5 reductions attainable through the application of the best practical control technology currently available in each industry subcategory is as indicated in Table 33. The BOD_5 loads under "Final Effluent", are the suggested BOD_5 effluent limitation guidelines to be met by July 1, 1977.

Although the final effluent BOD_5 limits are evident from Table 33, the final effluent loads were derived by assuring the use of a biological system followed by sand filtration, it is not implied that plants must necessarily install a sand filter: it is possible that a number of plants may achieve the indicated final effluent waste loads through a biological treatment system operating at an average efficiency of 96% BOD_5 reduction.

This has been interpreted to be a 96% removal overall, 90% by biological treatment and 60% removal with sand filtration.

The Contractor believes that there is a relation between BOD and suspended solids.

TABLE 23

PERFORMANCE OF DAIRY WASTEWATER TREATMENT PLANTS

	Date From Unidentified Plant Sources (133)			Data From Identified Plant Sources		
Type of Treatment	Number of Plants	% BOD_5 Average	Reduction Range	Number of Plants	% BOD Average	Reduction Range
Activated Sludge	100	84.0	24-99.6	3	97.3	96.6-98.7
Trickling Filters	46	82.8	35-99.8	2	94.0	93.0-95.0
Aerated Lagoons	2	96.5	95-98.0	4	96.2	95.2-97.3
	Average	83.8		Average	96.1	
Stabilization Ponds	1	95.0	--	None	--	-- --
Combined Systems	None	---	--	4	95.7	91.9-99.6
Aerobic Digestion	None	---	--	2	30.5	19.8-41.3
Sand Filtration (of Secondary Effluent)	None	---	--	1	81.0	81.0-

BAT Controls

The Contractor has presented the following as guidelines for BAT:

1. Installation of a biological treatment system (activated sludge, trickling filter, or aerageted lagoon), designed generally in accordance with the suggested parameters set forth in Section VIII, and operated under careful management.
2. Installation of a sand filter of adequate capacity.

3. Where land is available, irrigating the wastewater by spray or ridge and furrow, if this can be done economically and satisfactorily.

Summary

The method for obtaining "Milk Equivalent" is complicated and probably could not be understood by many who should be able to calculate it. It would seem that set values for the various known materials could be listed.

The 90% BOD removals by biological processes is much too high and is not substantiated by results from many waste treatment plants. A more realistic figure would be 84% removal, as shown in the attached Table 23 (pg. 3).

It is doubtful whether the biological plants can be upped in efficiency by increased in-plant improvements and better operation of biological plants.

Suspended solids and BOD relationships are not necessarily ---- in biological effluents and in sandfilter effluents.

The kg BOD_5 received is difficult to interpret into meaningful plant effluent controls.

January 24, 1974

MEMORANDUM

SUBJECT : Dairy Products

FROM : Effluent Standards and Water Quality Information Advisory Committee

TO : EPA Dairy Products Discussion Group

Questions

1. Why are there important tables missing from the development document?
2. For receiving stations BPT for bulk milk, why are the max. day and the 30 day average 0.012#s/100#s?
3. What are the pretreatment standard for dairy industry wastes?
4. Why have you allowed such a wide spread between max. and avg. for the BOD of the Butter Category?
5. Are the factors 0.890, 1.031 and 0.691 for fats, proteins, and carbohydrates theoretical or from observations?
6. Why is the categorization of (Natural & Processed Cheese) based on pounds of BOD processed?
7. Is there something wrong with the BPT or BAT for Fluid Products?

January 25, 1974
10:00 A.M.

MEMORANDUM

SUBJECT : Dairy Products Industry

FROM : Effluent Standards and Water Quality Information Advisory Committee

TO : EPA Dairy Products Industry Discussion Group

Prior review of the proposed guidelines resulted in the preparation of statements and questions (see attached) that were presented to EPA Discussion Group in typed form along with verbal suggestions.

Comments on Questions

1. The Development Document available for reference did not contain many of the needed tables. These tables will be in the final published Development Document.
2. The BPT for bulk milk TSS was in error. It should have been .032 instead of .012#s/100#s.
3. The Pretreatment Standards for each industry will be published as a group.
4. The wide spread in max. and avg. values for the butter category is based on field data available.
5. The factors for fats, proteins and carbohydrates are based on theoretical and actual data.
6. There is still some question why the (Natural and Processed Cheese) category should have effluent limitations based on pounds of milk when nearly all others are based on pounds of BOD.
7. There is an error in the BPT and/or BAT limitations for Fluid Products.

Additional Input

It appears that there is still considerable modification of the Dair Industry Guideline and Development Document that must be done before promulgation.

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ELECTROPLATING
METAL FINISHING

PROPOSED ES&WQIAC FINAL REPORT METAL FINISHING INDUSTRY (ELECTROPLATING)

After making a study of the Contractor's report of the metal plating industry (electroplating) for copper, nickel, chromium and zinc, and after considering the comments of representatives from industry in two workshops held in Washington, D.C., the Committee has the following comments:

Industry Categorization

No effort at categorization is made. The size of plants is reported from 100 gallons (plating solution volume) to 50,000 gallons; the product mix is reported as electroplating of 10 or 20 different metals and alloys to electroplating of only one or two. There are 20,000 companies, including 3,500 job shops. A single number of 40 $\frac{\text{liter}}{\text{m}^2} / \frac{\text{mg}}{\text{liter}}$ is recommended for everyone. Of all the industries for which effluent guidelines are to be promulgated, electroplating is one for which subcategorization is essential.

Waste Characterization and Pollution Parameters

Actual raw waste loading is given for one plant, with mg/1 reported and no other information given. A 1965 Battelle report is referenced, giving industry-wide values. Guidelines are recommended only for Cu, Ni, Cr, Zn, Cn, and total suspended solids. In contrast, more than 15 parameters were suggested and detailed in the Guidance Document for the Metal Finishing Industry. In particular, the omission of cadmium and certain chelating agents appear critical. The use of a single number for the sum of soluble plus precipitated metal is questionable.

Waste Treatment Technology and the Guidelines

(1) The number 40 amp hr/m^2 for the whole industry is highly suspect and the number 40 $\frac{\text{liter}}{m^2} / \frac{\text{mg}}{\text{liter}}$ is probably in error. These numbers are essential to the establishment of effluent guidelines, in conjunction with concentration units of mg/1.

The Committee has doubts about the 40 $\frac{\text{liter}}{m^2} / \frac{\text{mg}}{\text{liter}}$, as shown in the attached three figures taken from data presented in Figures 16, 19 and 21 of the Battelle Report. In contrast to the inverse relation between liter/m^2 and mg/liter proposed by Battelle, there is no correlation, in any case.

It is desirable that these numbers be replaced by at least maximum water usage guidelines for various processes used by the electroplating industry. These guidelines can be a function of size of plant, age of plant, etc.

(2) The split of 90% rack plating vs barrel plating is directly in variance with fact.

(3) The use of total metal guidelines should be replaced by soluble metal in suspended solids guidelines. The total suspended solids guideline of 30 mg/1 is high by a factor of three, considering BPT.

(4) Many other metals and non-metals must be included as pollutants - (see the Guidance Document).

(5) Cost data is absent. The one operating cost curve given (Figure 15) should be revised. Cost data do exist for chemical precipitation processes in the electroplating industry - three are omitted from the report.

(6) An important problem which must be addressed (but in a different section of the law) is that of the safe disposal of precipitate sludges and of organic sludges containing heavy metals.

Comments

1. The effluent guidelines for the metallic ions are apparently based on the solubility of the metals and theoretical considerations based on the solubility products of the chemical reactions involved in the precipitation of the metallic constituents in their hydroxide form. The soluble portion of the metallic ions in the waste probably accounts for the limit of 40 sq mg/sq m. This seems to be adequate, if consideration is given only to the soluble portion of the metals present in the wastewater. The ES&WQIAC considers that it is not economically feasible to remove the soluble portion below the limit recommended in the Battelle's report.

2. The Committee visualizes that, although the copper can be precipitaped with relative easiness, it will be difficult to attain the 1.0 mg/1 at those places where the process waste contains constituents that may from a complex soluble ion, make the copper more soluble. As indicated in the Contractor's report, when solubilizing complexing agents are present, the

equilibrium constant of the complexing reaction has to be taken into account in determining theoretical solubility with the result that the solubility of the metal is generally increased.

There are existing plants where the in-plant segregation of wastes is difficult and in some instances impossible, especially those platers whose plants are located in buildings within the city, and whose system was not especially constructed to harbor the plating facility.

The dissolved solids present also a problem with the suggested standards, especially for copper and nickel, since, if these are made up of non-common ions, the solubility of the metal hydroxide can increase, following the DeBye-Huckel theory.

3. It appears that the only way to obtain the parameters suggested is by complete segregation of the stream wastes to prevent the build-up of dissolved solids and chemical reactions that will increase the solubility of the metallic ions to be precipitated. This can be attained in the new plants, as the designer must take into consideration the laws of solubility and the new effluent standards, but it is an impossible task in many instances in the existing facilities. As the report states, no generalization regarding degree of heavy metal pollution reduction is possible because of the mix of electroplating processes in a single plant and variety of metals in the raw waste of most plants. In-plant segregation of all waste streams according to metals is difficult, expensive,

impossible in some instances, and impractical in others.

4. The age of electroplating equipment and facilities is an important factor that should be considered. Some existing sources, as the report indicates, have a large investment in automatic plating machines which are difficult or expensive to modify for installation of additional rinse tanks after pre-treatment and post-treatment operations. At other existing sources, where space is at a premium, it might be expensive and sometimes impractical to re-design existing plating lines or the entire facility to accommodate additional rinse tank for optimum water conservation practices and changes needed to prevent the formation of the complex soluble ions.

5. ES&WQIAC is in agreement with the Contractor's report that with the currently available in-process controls to reduce rinse water usage, other advanced technology designed to close up the plant with complete re-use of water to achieve no discharge of pollutants cannot be considered for existing sources except in special situations. Best practicable control technology currently available for existing electroplating facilities would not achieve zero discharge of pollutants.

6. No mention is made in the Contractor's report on the discharge of wastes by the existing facility. The Committee considers that the suggested effluent standards will be difficult to attain at the existing facilities utilizing the sewer systems because of the following reasons:

(a) Formation of the complex-ions at the existing processes which impose a limit higher than proposed for particular ions. This could be 1.63 times higher than the theoretical solubility products in which the proposed standards are based.

(b) The high cost, and impracticability in some cases, to attain in-plant segregation of waste streams.

(c) The low volume of wastes of some of the small electroplating plant.

(d) The fact that some metallic wastes are removed in the sludge at the treatment plant. The experience of the wastewater treatment plants in New York is that approximately 50% of the metallic ions is retained in the sludge.

(e) Some of the plants are established in existing old buildings.

(f) These wastes have been discharged to the sanitary sewers for many years with no apparent detrimental effect to the wastewater treatment system or the microbiological action in the secondary treatment plants.

The Committee considers that these platers should be regulated by the State and local ordinances now in effect or as may be amended by the States. To impose the suggested standards to the existing facilities discharging into municipal systems is considered impractical at this time.

7. It is also recommended that the contents of page 69 of the Permits Program Report, which is not included in the Contractor's report, be included for the plater discharging less than 20,000 gpd. It is difficult for the small established

plater whose volume of wastewaters is less than 20,000 gpd to comply with the proposed standards. The metal plater with this low volume and discharging into the municipal sewer should be taken out of the standards, thus, making a subcategorization. In this case, the standard should be determined considering the formation of the complex-ions and their solubilities. A factor of 1.63 is suggested.

The Committee considers that the proposed standards are too stringent for the small established plater. The 20,000 gpd should be defined as if it refers to average flow, and what percentage of the time it can go over the 20,000 gpd.

8. The recommendations of the Contractor for copper, nickel, and zinc are the same as the theoretical principles of precipitation in their hydroxide form is the basic concept for their reduction. The Committee considers that it is impossible or probably difficult to segregate the in-plant stream wastes even in the exemplary existing plant. Since it is the normal practice not to install filters because of limitations of space at the existing facilities, consideration must be given to the laws on solubility of the complex-ions rather than establishing the standard by the stoichiometric point of reaction in a solution of a metallic ion as solute and pure water as the retaining medium. Considering these facts and the normal carryover in the existing plants,properly equipped with clarifying units and settling basins, it is suggested that a factor 1.63 (which has been observed in

practice), be added for the existing facilities to the parameters of copper, zinc, nickel and chromium.

9. Although the hexavalent chromium follows a different chemical pattern for its reduction or removal, as it first must be reduced to its trivalent form, it appears impossible to attain the 0.1 mg/1 concept, except at those plants equipped with clarifying units and filtering equipment. Very few existing platers have filters in their installations, and moreover, most of the plants are so old, that the installation of this equipment cannot be accomplished at the single plants.

10. The Committee considers that the 1.63 factor which applies to some metallic ions should be considered to cope for the presence of complex-ions and metallic hydroxide carry-over at the existing plants. Should this not be done, all those platers whose facilities do not permit the installation of the clarifying units and filtering equipment and appurtenances, will not be able to comply with the standards. Of course, the new sources can be constructed with these units since this is the only way the proposed standards can be met.

The Committee also considers that the limit of 30 mg/1 for suspended solids in the metal platers industry follows more in the line of defining secondary treatment for organic, domestic and industrial wastewaters rather than the metallic industry. It is the normal practice in exemplary plants to have suspended solids concentration of about 30 mg/1 in the effluent. As it is not the common practice to install filters in these plants, or at least in the existing ones, this limitation is too restrictive for the established plants. The 30 mg/1 can be attained only in:

a. Properly designed settling and clarification facilities.

b. Effective use of flocculating agents

c. Careful removal of settled solids

d. Adequate detention time in the settling units

With all these units, the data indicates that the exemplary plants generate an effluent with 20-24 mg/1 of suspended solids.

This cannot be attained by the existing platers most of the time. Thus, it is the opinion of the Committee that the 30 mg/1 is somewhat restrictive.

It is considered also that no settling technique, as the report indicates, is 100 percent effective, and some of the floc is found in the effluent, (about 10 to 20 per mg/1) which contains from 2 to 10 mg/1 of metal. Although polishing filters or sand filters can be used on the effluent following clarification, this is not commonly done. Besides, the effectiveness of such filtering has not been ascertained.

ES&WQIAC considers that although the Contractor's report clearly indicates the shortcomings for attaining the reduction in the suspended solids, a strict limit of 30 mg/1 is suggested, and indicates that part of the metal is contained in these suspended solids. Should a careful study of the report be made considering the difficulty to attain a complete removal of the suspended solids, and of the metallic hydroxides contained in the suspended solids, it is obvious that the industry must make necessary in-plant segregation of wastes or install clarifying and filtering equipment to attain the 30 mg/1 concept and reduce or eliminate the metallic ions escaping as hydroxides. The standards to be prepared for existing plants should add a factor of 1.5 for the suspended solids based on the considerations that the Contractor's report indicates.

11. The Committee agrees with the limit for cyanides. These can be adequately treated and sometimes disposed of or oxidized at the treatment plant.

The Committee recommends the following standards expressed in mg milligrams per liter.

Category A: Those plants generating less than 20,000 gpd, and discharging into the municipal sewerage system, complying with existing municipal sewer ordinances. The flow cannot be higher than 20,000 gpd on 10% of the time period in one month.

Category B: New sources discharging into a point industry-government system (industrial park) 1.63 times the suggested standard (except cyanide).

Category C: New sources discharging into waste streams.

Contractor's Recommendations

(See Table I attached)

ES&WQIAC Recommendations

Category A: Those plants generating less than 20,000 gpd and discharging into the municipal sewerage system.

Comply with the existing sewer ordinances. The flow cannot be higher than 20,000 more than 10% of the time.

Category B: Plants with effluents higher than 20,000 gpd.

ES&WQIAC recommended guidelines are included as Table II. (Table II attached)

Basis for ES&WQIAC Recommendations

1. The ES&WQIAC recommendations consider that the formation of complex ions will theoretically raise the solubility of the metallic ions which is apparently not considered in the Contractor's report. According to theoretical considerations, the formation of the metallic ions will raise the solubility of the metals by at least 1.63.

2. Although the Contractor's report allows for suspended solids in the effluent, apparently no consideration is given to the fact that some metallic hydroxides will escape in the effluent and will appear as soluble metallic ions in the analysis. An allowance is also given to the metals going in its hydroxide form in the effluent.

3. ES&WQIAC is in agreement with the 40 mg/sq m as recommended by the Contractor. This is based on the soluble metal, that is, the metal in solution. To this figure, ES&WQIAC adds considerations for the solubility of complex metallic ions

and the presence of metals in the suspended solids escaping the process plant.

TABLE I

RECOMMENDED EFFLUENT LIMITATIONS FOR THE ELECTROPLATING INDUSTRY TO BE ACHIEVED BY JULY 1, 1977, BASED ON BEST PRACTICABLE CONTROL TECHNOLOGY CURRENTLY AVAILABLE (BPCTCA)

	Effluent Limitations(a)					
Production Basis	Plated Area(b)		Coulombic Equivalent(c)		BPCTCA Effluent Equivalent (d	
Unit	mg/m^2	lb/10^6 ft^2	mg/AH	lb/10^6 AH	mg/l	lb/10^6 gal
Parameter						
Copper (Cu)(e)	40	8.2	1	2.2	1	8.4
Nickel(Ni)(e)	40	8.2	1	2.2	1	8.4
Chromium, hexavalent (Cr^{6+})(e)	4	0.8	0.1	0.2	0.1	0.8
Chromium, total (Cr_T) (e) (f)	40	8.2	1	2.2	1	8.4
Zinc	40	8.1	1	2.2	1	8.4
Cyanide, oxidizable (CN) (g)	4	0.8	0.1	0.2	0.1	0.8
Cyanide, total (CN) (h)	40	8.2	1	2.2	1	8.4
Total Suspended Solids (TSS) (i)	1200	250	30	66	30	250
ph range 8.5 to 9 (j)						

TABLE II

RECOMMENDED EFFLUENT LIMITATIONS FOR THE ELECTROPLATING INDUSTRY TO BE ACHIEVED BY JULY 1, 1977, BASED ON BEST PRACTICABLE CONTROL TECHNOLOGY CURRENTLY AVAILABLE (BPTCTCA)

EFFLUENT LIMITATIONS

Production Basis	Plated Area	
Unit	mg/m^2	$lb/10^6\ ft^2$
PARAMETER		
Copper (Cu)	75	15.3
Nickel (Ni)	75	15.3
Chromium, hexavalent (Cr^{6+})	6	1.4
Chromium, total (Cr_T)	80	15.3
Zinc	80	15.3
Cyanide, oxidizable (CN)	7	1.4
Cyanide, total (CN)	40	15.3
Total Suspended Solids (TSS)	1200	250
pH range 8.5 to 9		

January 8, 1974
2:00 P.M.

MEMORANDUM

SUBJECT: Electroplating Industry

FROM : Effluent Standards and Water Quality Information Advisory Committee

TO : EPA Electroplating Discussion Group

Prior review of the proposed guidelines resulted in the preparation of questions (see attached) that were presented to EPA Discussion Group in typed form along with suggestions for the consideration of the group.

Comments on the Questions

1. Concentration of constituents in effluents seem to be of no concern to Effluent Guidelines Division.
2. The limits on metals does include the precipitated portions.
3. Raw waste loads have to be obtained from the Development Document for the guideline.
4. There was no clear cut answer given to this question. It seems essential that the promulgated guideline be helpful in issuing permits.
5. The maximum limit is only twice the average when the data indicates that it should be.
6. No real satisfactory answer was presented for this question.
7. It was stated that all electroplaters know the area of part they are plating because they compute the area prior to contracting to do a job.

Additional Input

There has been a cut-off in the regulations on small plants. The exact wording has not as yet been made available. It was stated that small industry is going to be given a free ride when the guidelines is promulgated.

A proposed preptreatment regulation is to be promulgated for all industries.

January 8, 1974

MEMORANDUM

SUBJECT : Electroplating

FROM : Effluent Standards and Water Quality Information Advisory Committee Represented by Don Bloodgood and Dr. Martha Sager

TO : EPA Electroplating Discussion Group

Questions

1. What are the anticipated concentrations indicated by the limits set?
2. Do the limits set include the precipitated metals in the suspended solids?
3. What is the raw waste load of copper, zinc, nickel, chromium, in the plating process?
4. How does a control agency indicate to a manufacturer what treatment is required, and then, how does he (the control agent) determine if the required treatment has been attained?
5. Why is the max/average always 2 regardless of constituent?
6. Why is BPCTCA/BATEA always 2 regardless of constituent?
7. How does anyone measure the surface area plated?

Suggestions

1. Use the concentration concept instead of the plating surface basis.
2. Take into account the formation of complex ions.
3. Indicate the volume of water that has been used in the computation of limiting values.

4. Indicate raw waste loads.
5. Indicate the degrees of treatment that are expected.

PROBLEM - How not to exceed limitation number?

GIVEN - Effluent Limitation number in mg/m^2 or in $lbs/10^6$ sq. ft.

NEEDED - (1) area of parts to be plated per given day

(2) flow of water to be used per given day

(3) Concentration of metals in the influent and in effluent

Determination of Raw Waste Load

Effluent concentration
Effectiveness of Process in meeting the limitation number

A = Flow X metal conc X conversion factor = lbs. metals in raw waste

B = Flow X metal conc X conversion factor = lbs. metal in effluent

$\frac{B}{\text{area}}$ plated part = guideline number

$\frac{A-B}{A}$ X 100 = Percent removal of metal in the treatment

FEEDLOTS

ES & WQIAC REPORT ON DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND FEEDLOT INDUSTRY

General

The ES&WQIAC Committee has completed an evaluation of the draft of the subject document prepared for the United States Environmental Protection Agency by Hamilton Standard Division of United Aircraft Corporation. Information procured by the Committee in addition to the Hamilton Standard report, included one workshop held in Washington, D.C. and the draft report, used as a basis for the 1971 interim guidelines, prepared by Midwest Research Institute.

The Committee has concluded that this document under discussion needs considerable editing and modifications in certain respects.

The Committee presents the following comments and recommendations and they follow the outline in the RFP given to the contractor.

Industry Categorization

The proposed categorization appears to be quite adequate.

Waste Characteristics

It is recognized that data available on the feedlots industry is indeed limited and that one cannot provide statistically sound data on waste characterization and quantities of waste produced in this rather unusual industry.

Pollution Parameters

The pollution parameters are satisfactory and adequate.

Control and Treatment Technologies

Particular attention is directed to the manner in which the report considers the method of land disposal of manure and liquid waste. The analysis of land utilization for disposal of animal wastes is worthy of attention by others who consider this method as the ultimate answer to a zero discharge requirement.

This report justly emphasizes the distinction between land spreading of crop nutrients and moisture as contrasted to land spreading for waste disposal.

The reluctance of Hamilton Standard to recommend land spreading above crop nutrient and moisture requirements is commendable.

It is essential that adequate recognition be given to problems, related to feedlot run-off and control. Whether the guidelines can be followed will depend upon adequate feedlot run-off control measures based on agriculturing and engineering principles and practices.

The possible variations in the technology for the handling of the wastes from the feedlots for ducks makes it possible to meet the current and future needs for the adequate handling of these wastes.

Some of the more promising technologies presently in the experimental stage depend upon refeeding techniques. A major obstacle to application is the reluctance of the Food and Drug Administration to approve refeeding. The FDA will be invited to discuss with the Committee the problems associated with the necessary clearances in order that further guidance on this matter can be presented.

Cost, Energy & Non-Water Quality Aspects

The cost analyses presented in the Report are not adequate to enable reliable cost effectiveness evaluations. It is suggested that the contractor make use of the cost data presented in the Midwest Research Institute report "The Pollution Potential of the Confined Livestock Feeding Industry", dated June 1971.

BPT

The Committee is in general agreement with the proposed effluent guidelines for 1977 and the Level I technologies.

BAT

The Committee is also in agreement with the proposed limits indicated as BAT for 1983.

New Source Performance Standards and Pre-Treatment Standards

It is agreed that the new source standards should meet the BAT for 1983. The Section of New Source Performance Standards should place more stress on site selection for new sources.

Allowance for Variability in Treatment

Copper

TOXICITY TO FISH & OTHER AQUATIC LIFE

Species	Concentration mg/1
Barnacles	10-30 in 2 hours
Mytilus edulis	0.55 in 12 hours
Oysters	0.1 - 0.5
Soft Clam (*Mya arenaria*)	0.5 in 3 days
Giant Kelp (*Macrocystis pyrifers*)	0.1 in 2-5 days
Ret tide organism (*Gymnodinium breve*)	0.05
Generally: bacteria & Microorganisms	0.1 - 0.5
Oyster Larvae	0.1 - 0.5
Young eels	0.13 for 50 hrs. as $CuCl_2$ $2H_2O$
Blue gill sunfish (soft water)	1.25 96 hr. TLm
Rainbow Trout (Lake Huron)	5.0 in 10 hrs as $CuCl_2$ $2H_2O$
Sea Lamprey	5.0 in 12 hrs as $CuCl_2$ $2H_2O$
Daphina magna, young	0.027 as CuCl
Cyclops vernalis	2.7
Mesocyclops leuckarti	1.9
Diaptomas oregonensis	0.0024
Hemacheilus barbatulus	0.20 in 24 hrs.
Nereis sp. (warm)	0.1 (threshold)
Carcinas maenas (shore crab)	1-2 (threshold)

Species	Concentration mg/1
Leander squilla (prawn)	0.5 (threshold)
Crayfish, young	0.125 - 0.6
Salmo gairdnerii	0.4 - 0.5

Fish	Maximum Concentration tolerated as $CuSO_4$
Perch	0.5
Black bass and bluegills	0.8
Sunfish	1 - 35
Black bass	2.00

Copper (Continued)

TOXICITY OF COPPER SULFATE TO ALGAE

Species	Toxicity
BLUE-GREEN ALGAE	
Cylindrospremum	2.0-4.0 mg/1 Toxic for 28 days
Anabaena	
Anacystis	
Calotnrix	
Nostoc	
Oscillatoria	
Plectonema	
GREEN ALGAE	
Arkistrodesmus	
Chlorella	
Closteriums	
Oocystis	
GREEN ALGAE	
Scenedesmus	
Stigeoclonium	
Zygnema	
GREEN FLAGELLATE AND YELLOW ALGAE	
Clamydomonas	
Pandorina	
Tribonemas	
Gomphonema	
Navicula	
Nitzschia	
Anabaena	0.09 Conc. mg/1
Beggiatoa	5.0
Chara	0.2-5.0
Cladophora	1.0
Cladothrix	0.2
Conferva	0.4
Nauicula	0.7
Oscillatoria	0.1-0.4
Scenedesmus	5.0-10.0
Spirogyra	0.05-0.3
Ulothrix	0.2
Volvox	0.25

Zinc

ENVIRONMENTAL EFFECT UPON MAN

Effect	Zinc Concentration (mg/1)
Gastrointestinal irritant	675-2280
Milky appearance to drinking water	30
Greasy film on drinking water (after boiling)	5.0
Taste threshold in spring water	27.2 (as $ZnSO_4$)
Taste threshold in distilled water	17.6
No known detrimental effect	11.2 to 26.6
" " "	23.8 to 40.8
Nausea & fainting	30

TOXICITY ON FISH LIFE AND EFFECT OF HARDNESS, TEMPERATURE & pH CONCENTRATIONS, mg/1

Species	Water	Temperature	°C
		18-20	30
Lepomis	Soft	2.9 - 3.8	1.9 - 3.6
Macrochirus	Hard	10.1 - 12.5	10.2 - 12.2
"	Soft	2.86 - 3.75	0.9 - 2.10
"	Hard	6.60 - 9.47	6.18 - 9.50
Physa	Soft	0.79 - 1.27	0.62 - 0.78
Heterostropha	Hard	2.66 - 5.57	2.36 - 6.36
(pond snail)			
Pimephales	Soft	0.96	-
Prumelas	Hard	33.4	-
Zepomis	Soft	5.46	-
macrochirus	Hard	40.9	
Bluegill Sunfish	Soft	2.9 - 3.8	1.9 - 3.6
"	Soft	4.2	-
"	Hard	10.1	- 12.5
"	Hard	12.5	- 12.9
Flathead	Soft (50 mg/1)		4.9 pH = 8.0
Minnow	Hard (200 mg/1)		32.2 pH = 6.0

FEEDLOTS

American National Cattlemen's Assoc
Washington, D.C.
Ltr. 7/10/73 re: Hamilton Standards Report
and meeting held CM#2 7/4/73 w/attached
report comments

Natural Resources Defense Council
New York, N.Y.
Ltr. 7/19/73 to A. Cywin re:
comments on draft dev. document
for industry

FERROALLOYS

ES&WQIAC REPORT ON DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES FERRO ALLOYS INDUSTRIES

General

The ES&WQIAC Committee has completed its evaluation of the draft of the subject document prepared for the United States Environmental Protection Agency by Data Graphics, Inc. This is the extent of information available to the Committee as interim guidelines had not been developed and no industry participated in scheduled workshops.

This is a rather unique industry as historically it has never been considered a major stream polluter and has become so primarily through the advent of more rigid air pollution control measures. The use of wet scrubbers has added materially to the pollution load from this industry. The major characteristic of this report is recognition of the investigators that the industry has not exercised sophisticated water pollution control measures in general and for this reason there is practically no information in the literature. The information obtained through sampling programs was limited to a great degree due to the lack of adequate existing waste treatment processes. It was the general observation of the Committee that in such an industry the normal procedure of determining best practical technology and best available technology is not entirely applicable. The report on the whole is quite difficult to follow with considerable backtracking needed to try to tie the various elements together. On the whole it is not considered an adequate document for distribution to regional offices and others for the determination of permit requirements.

The Committee presents the following comments and recommendations on specific sections of the report.

INDUSTRY CATEGORIZATION

The proposed industry categorizations appears to be adequate and meet the needs for data collection and determination of guidelines.

WASTE CHARACTERIZATIONS

The data presented provides vary minimal information on the waste characteristics expected from the various categories in the ferro alloys industry. It is recognized by the committee that there is essentially no information in the literature and that the short time period available under this contract did not permit the procurement of statistically valid raw waste characteristizations. It is recommended that effort be made during the first two years of the permit program to obtain a better definition of the raw waste.

POLLUTION PARAMETERS

The pollution parameters are satisfactory.

CONTROL AND TREATMENT TECHNOLOGIES

The contractor recognizes the water pollution control and treatment technology used in the ferro alloy industry in general is not very sophisticated. It also properly states that such technology is generally marginal. He however makes no attempt to consider technology from related fields, such as the electroplating industry. Unfortunately the data that is presented is sketchy and does not represent enough sampling to provide a reliable picture of how effective present technology is. Some of the data is rather surprising. An example is plant D beginning on page 81. This is a sophisticated waste treatment plant and it is surprising that the effluent concentration of manganese, zinc and iron are as high as presented.

COST, ENERGY AND NON-WATER QUALITY ASPECTS

These aspects are primarily based on the limited experience in an industry that admittedly has not met water pollution challenges in an adequate manner. Reevaluation is needed after a critical review of BPT and BAT.

BPT

The overall determination of BPT was based on the average of the best existing plants of various sizes, age and unit processes within the industry category. In an industry that has done so little towards solving its stream pollution problems, it is not considered that this is a valid basis for determining BPT. Of concern to the Committee are some of the high discharge limitations presented in Table 108. Manganese levels are high throughout and in Category III total chromium is excessive. It is recommended that the contractor critically review technologies that are present in related fields prior to reaching his final recommendations.

BAT

The same statements that were made on BPT and BAT. Particular attention is invited to Table 110 which has excessively high limitations of some constituents in all categories excepting Category III. It is surprising to note that in a number of instances BAT limitations on constituents are higher than BPT in Table 108. Category III concentrations of Cyanide are particularly conspicuous.

NEW SOURCE PERFORMANCE AND PRE-TREATMENT STANDARDS

The same observations apply to these standards as we applied to BPT and BAT.

OF 3

PB

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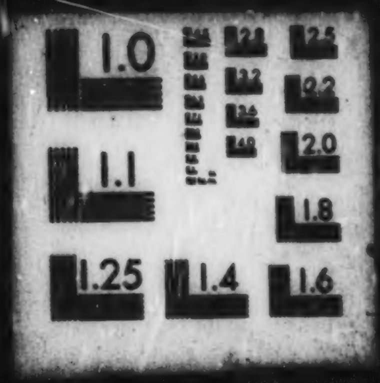
1.0
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NON-FERTILIZER PHOSPHATES

ES&WQIAC REPORT ON DRAFT DEVELOPMENT DOCUMENT FOR NON-FERTILIZER PHOSPHORUS CHEMICALS

The overall report appears to reach the decision concerning zero discharge as BPT without adequate justification. A serious error evidently has been made concerning TVA's Muscle Shoals Plant.

Industry Categorization

The industry is subdivided into three groups: phosphorus production; phosphorus consumption to manufacture high-grade phosphoric acid and other chemicals; and phosphate manufacture from phosphoric acid. There appears to be a substantial basis for subdivision based on geographical location, particularly considering rainfall, and on product mix: both of these factors have a strong influence on the decision concerning total discharge as BPT.

Waste Characterization and Pollution Parameters

Typical raw waste loadings are given as a range; specific plant-by-plant data are not given. The pollution parameters are correct and the list appears to be complete.

Waste Treatment Technology and the Guidelines

The guideline of zero discharge of elemental phosphorus for Level I technology from all segments of the industry is BPT and is achieved today by virtually all plants in the industry.

The guideline of zero discharge of PO_4-P, F. and TSS (total suspended solids) for the three broad industrial segments is not BPT and it should not be the Level I guideline. The recommendation of zero discharge is based on two plants: Hooker Chemical and TVA's Muscle Shoals Plant. However, General Technologies Corporation did not visit TVA's plant, based its decision on two open literature references and misinterpreted those references. In fact, TVA's Muscle Shoals Plant does not achieve zero discharge. To establish BPT on the basis of one plant (Hooker) is not reasonable.

Instead of zero discharge, the following range of values is recommended as Level I technology:

PO_4-P: 0.2-0.4 lb/ton
F : 0.2-0.3 lb/ton
T.S.S.: 0.5-1.0 lb/ton

Within the indicated range, the exact number should be determined from industry segmentation, based on the overall industrial category (phosphorus production, etc.), geographical location (annual rainfall), and product mix (particularly few-product versus many-product plants). For each sub-category, BPT is double liming plus vacuum filtration.

The guidelines for PCl_3 and $POCl_3$ appear to be correct, as do the Level II and III guidelines. The pretreatment standards for T.D.S. (total dissolved solids) are not clear in that they refer to zero discharge guidelines. BPT for T.D.S. is not at all clearly established in the report.

Finally, Monsanto raises a point concerning well-water intake and surface-water discharge, vis-a-vis zero discharge, that merits careful consideration by E.P.A.

PHOSPHATE MANUFACTURING
(Non Fertilizer
Phosphates)

SEE LTR.

FMG Corp.
New York, N.Y.
7/27/73 in FERTILIZER

Izaak Walton League of America
Report w/comments on draft dev.
document for industry

FERTILIZER

January 25, 1974
9:00 A.M.

MEMORANDUM

SUBJECT: Fertilizer Industry

FROM : Effluent Standards and Water Quality Information Advisory Committee

TO : EPA Fertilizer Industry Discussion Group

Prior review of the proposed guidelines resulted in the preparation of statements and questions (see attached) that were presented to EPA Discussion Group in typed form along with verbal suggestions.

Comments on Questions

1. Because of the shortage of lime, the guideline limit will be changed to a number between 10 and 40 for BPT.
2. The proposed guideline is said to be deficient and it is to be modified.
3. Steam stripping is desired, but other methods will be considered.
4. Contaminated cooling water will not be considered at this time. It is only considered in part.
5. Nitrogen fertilizer limitations are based on collected data shown in the Development Document.
6. It is possible that the regulations for effluent control of the ammonia nitrate subcategory will be changed. Ion exchange is being taken out for BPT.

Additional Input

The energy crisis is having an impact on the effluent requirements.

The Commerce Dept. has asked many of the same questions raised by ES&WQIAC.

January 25, 1974

MEMORANDUM

SUBJECT : Fertilizer

FROM : Effluent Standards and Water Quality Information Advisory Committee Represented by Don Bloodgood and Dr. Martha Sager

TO : EPA Fertilizer Discussion Group

Questions

1. What is the rationale for changing the number 10 to 40?
2. Where is the documentation for the Suspended Solids limitation?
3. What is BPT for Ammonia regulation during treatment?
4. What are the possibilities for contamination of cooling waters? Is this considered in the limitation?
5. What is the rationale behind the Nitrogen Fertilizer limitation?
6. Are you aware that the guideline for Ammonia Nitrate will put the manufacturers of the prilled product out of business?

FIBERGLASS

ES&WQIAC REPORT ON DRAFT DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE INSULATION FIBERGLASS INDUSTRY

General

The ES&WQIAC Committee has completed an evaluation of the draft of the subject document prepared for the United States Environmental Protection Agency by the Effluent Guidelines Division.

The Committee has concluded that the document under discussion needs editing and modifications in certain respects.

The Committee presents the following comments and recommendations and they follow the outline in the RFP given to the project officer for this guideline.

Industry Categorization

It is agreed by the Committee that the industry can be considered to be all in one category.

Waste Characteristics

There does not seem to be any reason to be concerned with the characteristics of the wastes from this industry inasmuch as the appropriate and most satisfactory method of waste elimination is zero discharge, by evaporating all of waste waters on the hot final product.

Pollution Parameters

The guideline rightly lists the following parameters as information in identifying the wastes:

Phenols
BOD5
COD
Dissolved Solids
Total Suspended Solids
Oil and Grease
Ammonia
pH
Alkalinity
Color
Turbidity
Temperature
Specific Conductance.

Control and Treatment Techniques

Solids separation, reuse of water, with evaporation on the hot final product meets all of the requirements for a method of waste water control with no contamination of the environment.

Cost, Enery & Non-Water Quality Aspects

The report rightfully points out and substantiates that zero discharge is the most satisfactory and economical method for the treatment and/or elimination of the wastes from the plants producing fiberglass.

BPT

The BPT indicated by the report is the evaporation of the waste on the final product. It is pointed out by the Committee that it may be necessary to permit land application of waste up to 1977.

BAT

The report substantiates that the best available technology is zero discharge.

New Source Performance Standards and Pre-Treatment Standards

The new source performance standards rightfully requires zero discharge for all new fiberglass plants.

The report should indicate that wastes from this industry should be given primary treatment prior to the discharge to a municipal sewer system. Municipal officials should be warned to give thorough study to the situation before admitting the waste waters into the sewers and wastewater treatment plant.

Allowance for Variability in Treatment

(Not applicable for the fiberglass industry).

Methodology for Application of Effluent Limitations

(Not applicable for the fiberglass industry).

FRUITS
AND
VEGETABLES

ES&WQIAC REPORT ON FRUIT AND VEGETABLE PROCESSING INDUSTRY

General

The Contractor's report shows a good description of the processes utilized by the industry and the treatment technologies. However, not all the canned industry is discussed in the report. The ESWQIAC comments are based on the Contractor's report and one meeting held with representatives of industry.

Industry Categorization

ESWQIAC agrees with the industry categorization as recommended by the Contractor, but wishes to indicate that not all the canners are represented. Industry recommendations include guidelines for a higher number of products. ESWQIAC does not agree with the Contractor recommendation of sub-dividing the industry between small and large packers. It could be noticed in their recommendations that BPT for big and small packers are about the same.

Treatment Technologies

The description of the treatment technologies is adequate. There are problems in some industries where Nitrogen must be added to prevent bulking at those plants utilizing the activated sludge process. ESWQIAC considers that any method that can reduce BOD and suspended solids by 90% should be acceptable. Aerated lagoons, oxidation ponds and anaerobic lagoons have showed in practice that can remove 90% BOD and suspended solids if properly operated.

RWL

There is a great difference between the Contractor's estimate and Industry estimates for RWL. Table I shows the RWL as reported by the Contractor.

TABLE I

RWL AT EXEMPLARY PLANTS - CONTRACTOR'S REPORT

Category	Product	BOD (Lb/ton)	Susp.Solids (Lb/ton)
1	Apples-Slices & Peel	14.0	1.4
2	Apples-Juice	4.0	0.6
3	Citrus-Juice, Oil	8.5	0.6
4	Citrus-Peel	1.8	0.4
5	Citrus-Juice, Oil, Peel	4.2	0.5
6	Potatoes-Dehydrated	30.2	25.0
7	Potatoes-Frozen	40	30

Recommended BPT Guidelines-Industry

Industry recommendations for BPT are included as Table II.

TABLE II

EFFLUENT LIMITATION PROPOSAL

	SUSPENDED SOLIDS (lbs/ton)	
	NCA Existing Plants by July, 1977	NCA Existing Plants by July, 1977
Apples	10.2	2.1
Apricots	9.9	6.7
Asparagus	3.0	3.0
Beans, Snap	3.7	2.8
Beets	7.5	7.1
Carrots	11.2	5.2
Cherries	3.5	1.8
Citrus	2.3	0.6
Corn	5.6	3.5
Peas	11.0	4.1
Peaches	8.0	4.1
Pears	7.5	2.8
Potato, White	7.4	6.8
Pumpkin & Squash	5.6	1.5
Sauerkraut	3.1	0.3
Spinach	3.9	3.1
Sweet Potato	13.0	4.7
Tomato	2.4	1.2

ESWQIAC considers that the recommendations by industry are too high for those industries selected by the Contractor. According to the data studied, it appears that the RWL estimate by industry is much higher than that reported by the Contractor.

ESWQIAC Recommendations for BPT

Esquiac recommendations for BPT are indicated in Table III. These are based on 90% removal of BOD and suspended solids by activated sludge, trickling filtration, anaerobic lagooning. The recommendations are also based on RWL as reported by the Contractors.

TABLE III

ESWQIAC RECOMMENDATIONS FOR BPT

Category	Product	ESWQIAC		Contractor's Recom	
		BOD	Susp.Solids	BOD	Susp. Solid
		Lbs per ton		Lbs per ton	
1	Apple-Sliced	1.5	0.3	0.7	0.5
2	Apple-Juice	0.5	0.3	0.5	0.3
3	Juice-Oil	0.9	0.3	0.6	0.3
4	Citrus-Peel	0.4	0.4	0.4	0.4
5	Juice-Oil, Peel	0.5	0.5	0.5	0.5
6	Potato, Dehydrated	3.0	2.5	1.2	2.4
7	Potato, Frozen	4.0	3.0	2.0	3.0

It should be noticed that ESWQIAC and Contractor's recommendations are about the same in most instances. Although industry agrees with an effluent reduction of 90%, their figures are higher because of higher RWL estimates than those observed by the Contractor, or those used by ESWQIAC.

GRAIN MILLING

January 18, 1974
10:00 A.M.

MEMORANDUM

SUBJECT: Fruits and Vegetables (Canned and Preserved)

FROM : Effluent Standards and Water Quality Information Advisory Committee

TO : EPA Fruits and Vegetables Discussion Group

Comments on Questions (Guzman and Smith)

1. The guideline limits are based on pounds per ton instead of pounds per 1000#s because the industry measures input in tons.
2. The information on waste flows has to be found in the Development Document. There does not appear to be any chance to get flow data into the guidelines.

Additional Input

There is to be a major revision of these guidelines prior to promulgation.

It is anticipated that the limiting values will be 50% higher than those published in the Federal Register.

Reference will be made in the promulgated guidelines directing the reader to the Development Document.

The National Canners Association has been very helpful in securing additional essential data.

August 1, 1973

Report to: Effluent Standards and Water Quality Information Advisory Committee, U.S. Environmental Protection Agency

From : W. Wesley Eckenfelder, Jr.

Re : GRAIN MILLING

Industrial Categorization

The industry has been divided into four subcategories, including two subdivisions based upon raw materials from production processes. The age and size of the plants was not considered significant. This subcategorization appears to be quite satisfactory for this industry and is reasonable with respect to waste treatability.

Waste Characterization

Grain milling wastes consists primarily of suspended solids and biodegradable organics which makes it quite feasible to categorize the waste in terms of BOD, COD and suspended solids. Since there is a good correlation between BOD and COD, it is not unreasonable to consider categorization based on COD. There appears to a be a high variability in volume, as indicated in Figure 11 of the report. There is also a fairly high degree of variability in the BOD. Unfortunately the data is not available to develop statistical relationships for these parameters. It should be noted; however, that some plants have once-through cooling while others have recirculated cooling water. It should be possible to develop statistical relationships for both cases.

Treatment and Control Technology

In-plant controls primarily consider segregation of cooling water and the use of surface condensers. A number of treatment plants are described with their performance as case histories. The exemplary plant consisted of activated sludge followed by two lagoons (page 68) producing an average effluent BOD of 35 with a range in effluent quality of 6-95 mg/1. It is felt that a major part of this BOD is probably due to carryover suspended solids. The other plants discussed involving activated sludge all show a high variability in effluent BOD and suspended solids. It is noted in the report however, that the organic loading (F/M) for these processes was probably designed too high and that insufficient control over the influent loading to the process has been exercised resulting in frequent bulking and carryover suspended solids to the effluent. Level 1 technology indicates an effluent BOD of 50 mg/1 and suspended solids of 75 mg/1 for wet and dry corn milling where cooling water is recirculated. The contractor recognizes the volumetric considerations indicating an effluent BOD and suspended solids of 20 and 30 mg/1 respectively for once-through cooling systems. This is consistent with establishing a pounds level relevant to production for the plant effluent. Level 2 considers the addition of filtration to the wastewater treatment plants for further reduction of BOD and suspended solids. This is entirely consistent with present technology.

Miscellaneous Considerations

Data has not been developed in the report to indicate the variability in the wastewater treatment plant effluent. There is also insufficient data to establish the variability in raw waste loading. In a highly biodegradable material such as grain milling wastes, biological treatment process design and control is of the utmost importance if the process is to function effectively. It is felt that the data from plants presently in operation as reported by the contractor does not represent exemplary plant performance. The levels proposed by the contractor for Levels 1 and 2 appear to be reasonable, but the variability information and temperature effects on the processes is vital to establish the guideline figures.

INORGANIC

CHEMICALS

January 17, 1974
1:00 P.M.

MEMORANDUM

SUBJECT : Inorganic Chemicals Industry

FROM : Effluent Standards and Water Quality Information Advisory Committee

TO : EPA Inorganic Chemicals Discussion Group

Prior review of the proposed guidelines resulted in the preparation of questions (see attached) that were presented to EPA Discussion Group in typed form along with suggestions for their consideration.

Comments on the Questions

1. There are some misprints in the proposed guidelines and this is one of them that will be corrected.
2. The max, is twice the average based upon data available. It is said to be liberal.
3. The permit granters can take into account the solids in the raw water supply but the guidelines do not.
4. The inorganics listed for no discharge are now produced by non-water contact processes.
5. The promulgated guideline will not have a limit on magnesium, cobalt and vanadium. Iron is to be included as it is a measure of the effectiveness of the treatment process.
6. Zero discharge is practical for 1977 for a part of this industry so it was reported.
7. Spills in this industry are to be covered by a blanket guideline for all industry.
8. The volume of water used by the industry is not indicated in the guideline and a request was made for inclusion of this needed information.

9. Categorization has taken care of the situations where different plants are making the same product by different processes.

Additional Input

There will be no plants put out of business because of wastewater treatment requirements.

January 17, 1974

MEMORANDUM

SUBJECT : Inorganic Chemicals

FROM : Effluent Standards and Water Quality Information Advisory Committee Represented by Wes Eckenfelder

TO : EPA Inorganic Chemicals Discussion Group

1. Why is the maximum average for the electrolytic process TDM of producing hydrogen peroxide .004 Kg/kkg when the maximum average is 0.0002 lbs/1000#s? Maximum is not expressed in pounds but expressed in Kg/kkg twice.

2. Why is the max, day most always twice the 30 day average?

3. Do the limits for TSS take into account the TSS in the water supply; are they excluded?

4. Are the chemicals now listed for "no discharge" for BPT now produced by non-water-contact processes?

5. Why are there no limits on 30 day averages for Magnesium, Cobalt, Iron and Vanadium in the BPT and BAT for titanium dioxide produced by the sulfate process?

6. Is zero discharge requirement practical for 1977?

7. How do the guidelines take into account contained spills, nonrecyclable wastes, treatment plant failures and interruptions, Acts of God, and multi-product plant considerations?

8. What volumes of process waters are being considered for each of the categories? Is it possible to include a range of volumes in the guidelines?

9. Is is realistic to expect every process making the same product to accomplish the same effluent in attempting to meet BPT, BAT, and N.S.?

10. Is information on raw waste loads available in the guidelines?

Suggestions

1. In the electrolytic process for producing hydrogen peroxide, have the average maximum of total dissolved metals express on both Kg/kkg and lbs/1000 lbs bases.
2. Give values or range of values for water usage in the guideline.
3. Give values for raw waste loads in the guideline.

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IRON AND STEEL

ES&WQIAC REPORT ON DRAFT DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE IRON AND STEEL INDUSTRY (COKE PLANTS)

BY: CYRUS WM. RICE DIV.
NUS CORP.
#68-01-1507

General

The Effluent Standards and Water Quality Information Advisory Committee, after and evaluation of the report prepared by C.W. Rice Division of the NUS Corporation, other data available and the inputs obtained during the workshops held with representatives of the iron and steel industry (coke plants) and other interested persons, has reached certain conclusions.

Industry Categorization

The categorization of the industry as proposed by the Contractor appears adequate to this Committee.

Waste Characteristics

It is realized that it is a big task to sample all the industries in each category. Data gathered appears to have been collected at only a very limited number of plants. This perhaps makes doubtful a sound statistical evaluation of the data collected.

Development of Criteria

The Committee could not make a sound evaluation of the data collected because of the very little data presented to justify the basis for the parameters of pollution suggested.

The report neither includes the data figures nor basis for their reasons or conclusions for reaching the proposed standards. The Committee has drawn its own conclusions based on data included in Supplement B of the Rice Report. Appendices A through C is a statistical analysis of this data. Individual parameters suggested in the report, and our comments, are as follows:

(a) Ammonia Reduction

The level recommended for the coke plants, 3 mg/1 in terms of concentration, and 100 gal per ton of coal coke produced, is apparently based on studies by Abson and Todhunter in 1959 (Reference 1) in the report, which indicates reductions to the proposed level by biological treatment in an activated sludge system after removal of phenols, thiocyanates and CN, followed by filtration. Although these studies were made in 1959, operation data to implement this investigation is lacking. The limit recommended is also intended for other techniques being developed. The reduction of NH_3 will notably increase the NO_3 concentration in the effluent. Most of the plants considered as exemplary by the Contractors are not at present meeting the proposed standards, since the standards are based on technology to be developed, not on existing practicable technology.

(b) Phenols

Recommended limit is 0.1 mg/1, based on 100 gal of waste water per ton of coke produced. This can be attained by biological oxidation, benzol extraction, solvent extraction, plus good maintenance and housekeeping. However, the literature indicates that some plants, after using fixed ammonia stills followed by activated sludge treatment generate an effluent with a phenol concentration higher than the proposed 0.1 mg/1 (Ref. Grosick). Additional treatment after activated sludge, ozonation and activated carbon, according to the technical literature (Ref. No. 55, Fisher, Hepner & Tullon, 1970) could be used to attain 0.012 mg/1. This data was obtained from laboratory scale research works. Based on the literature research used by the Contractor, the limit of 0.1 mg/1 phenol is not readily attained in the exemplary plants studied, but can be attained by a combination of processes as activated sludge, in a "free leg ammonia free liquor", utilizing ozonation and activated carbon. It should be noted, however, that Labine, Hall and Nellist found ozonation as economically unfeasible for the industry. The Committee agrees with the Contractor that the degree of treatment required to attain this level must include secondary plus advanced treatment or a combination of both. This would be too expensive for the strict effluent limitation recommended for this parameter.

(c) Cyanides

The recommended standard is 0.25 mg/1 for a flow of 100 gal/ton coke, but none of the exemplary plants surveyed by the Contractor are attaining this standard at the present time. The concentration is based on studies by Fisher et al (Ref. 55) and Black et al (Ref. 19), in the 1951 Purdue Industrial Waste Conference. The methods, however, have not been tested on large scale installations nor at any iron or steel plant in the country. Adana reports in the literature CN reduction to this limit utilizing oxidation lagoons 2,625 ft. long, 82 ft. w, 5 ft. d, on experiments conducted in the Netherlands. However, the use of oxidation ditches or lagoons as reportes by Adana have had very limited application in the United States because of the vast land requirements. To attain the suggested limit for CN, additional treatment beyond that normally practiced by the exemplary plants studied would be required. The limit could be obtained, according to the technical literature, by utilizing chemical treatment by alkaline chlorination or secondary stage biological treatment after removal of some noxious constituents and acclimatizing the microorganisms to the varied concentrations of cyanides in the wastewaters. The report indicates that future research may develop other alternatives for attaining Level I standards suggested. It is our opinion that Level I should not be developed based on future research, but rather on operational data at the existing plants in the country. To develop standards based on the literature, not on accomplished practice, as has been done by the Contractor, falls in the opinion of the Committee, out of the intent of the law as defined in Sec. 304 (b) of the Act. On the other hand, there are plants which are attaining the 0.1 mg/1 level in 90% of the time.

(d) Biochemical Oxygen Demand

The recommended standard is 10 mg/1, based on 100 gal of wastewater per ton of coke produced. This is based on a reduction of 95.6% of BOD at the plants. Although, theoretically, an activated sludge plant can reduce plus, it is the experience everywhere in the country that this degree is seldom attained because of several factors as changes in raw waste load, temperature changes and other factors. To pretend such high a reduction in the BOD is considered to be extremely restrictive considering an effluent suspended solids of 20-30 mg/1, the soluble effluent BOD would have to be less than 5 mg/1. It should be considered that the recent definition for secondary treatment by EPA calls for a BOD of 30 mg/1 in the effluent, which is adequate for the protection of the receiving waters. The Committee considers that the 95.6% reduction is difficult to attain under normal operation conditions or procedures. There appears to be no data in which the 10 mg/1 total (soluble plus suspended solids) BOD. There are very few wastewater treatment plants in the country, either industrial or municipal, that can attain this standard for BOD. It will be of interest to the Committee to know the basis or data used by the Contractor to arrive at the 10 mg/1 figure.

(e) Heat Load

The Contractor's report recommends that in determining allowable heat loads to be discharged to a receiving stream, case by case evaluation be made of the assimilative capacity of the receiving stream. It further recommends a maximum temperature of 110 deg F. The Committee is in disagreement with both concepts. A standard should be developed based on a mixing zone concept. The 110 deg F suggested is considered too high for the discharge of the heat load to the streams.

(f) Fluorides and Nitrates

The suggested parameters for fluorides and nitrates, 20 and 45 mg/1 are based on public health considerations. The first is based on the fact that mottled enamel occurs when water has a concentration of 20 mg/1 fluorideion, while the 45 mg/1 for nitrates is based on the USPHS standard for drinking waters, as the concentration that may cause methmoglobinemia in infants.

(g) Suspended Solids

Suspended solids should be those accepted for secondary treatment, that is 30 mg/1. The proposed standard of 20 mg/1 is too restrictive. The existing and exemplary plants cannot attain this standard.

The Committee understands that most parameters recommended by the Contractor are based on the combination of a series of process operation for the combined reduction and/or elimination of the particular troublesome ions present in the waste. It is considered that this is not necessarily the best approach for the solution to the problem.

Comments

Most of the parameters recommend in the Rice Report have been based on literature research, scientific possibilities and pilot studies rather than by data gathered during the Contractor's study or actual operations. The Committee considers that there has been a confusion on the Contractor's part in his interpretation of the BPT concept. His standards appeared to be based on BAT, which although proved in pilot plants and laboratory scale, have not been adequately proved through practical operations in any existing plant in the country, including the exemplary plants selected.

The Committee considers that no parameter should be less restrictive for the industry than those defined by secondary treatment, when dealing with BOD and suspended solids.

It was with surprise that the Committee noticed that the Rice Report failed to include a single graph in the 450 pg. report. The cost figures and data should be graphically presented for easy review.

Table I shows the Rice Report Levels I, II and New Plants proposed limitations as compared to the four exemplary plants sampled by the Contractor for Cyanide, Phenol and Ammonia.

TABLE I

RICE REPORT SUGGESTED LEVELS AS COMPARED TO PLANT DATA AND EPA GUIDELINES

C.W. Rice Proposed Limitations Level I.II & New Plants			Exemplary Plants				EPA Guidelines May 1973	
			A	B	C	D	Schedule A	Schedule B
		mg/1						
Cyanide	.00021	0.25	0.122	0.102	0.025	0.307	.005	.01
Phenol	.000083	0.10	0.0017	0.148	0.080	0.00225	.0002	.1
Ammonia	.0025	3.0	1.22	1.11	0.1635	0.0662	.2	.3

Table II shows the parameters suggested for other constituents.

TABLE II

RICE REPORT RECOMMENDATIONS FOR BOD, COD, AND OTHER PARAMETERS

Constituent	lb./ton Coke	mg/1
BOD_5	0.008	--
COD	--	--
Sulfide	0.00025	0.3
Oil and Grease	0.0025	3.0
Suspended Solids	0.008	10.0
pH	6.9	--
Flow, Gal Per Ton	100	--

Tables III and IV are recommendations for effluent guidelines submitted by industry as to what parameters could be achieved.

TABLE III

PARAMETERS SUGGESTED BY AMERICAN IRON AND STEEL INSTITUTE

Parameters	Level I Standard				Level II Standard			
	Rice Report		Proposed		Rice Report		Proposed	
	PPT*	mg/l	PPTC**	mg/l	PPT*	mg/l	PPTC**	mg/l
Cyanide	0.00021	0.25	0.010	4.0	0.0021	0.25	****	****
Phenol	0.000083	0.10	0.0013	0.50	0.000083	0.10	0.00025	0.10
Ammonia	0.0025	3.0	0.35	140	0.0025	3.0	****	****
BOD_5	0.008	10.0	0.25	100	0.008	10.0	0.125	50
COD	—	—	1.25	500	—	—	0.75	300
Sulfide	0.0025	0.3	0.0025	1.0	0.00025	0.30	0.00075	0.30
Oil & Grease	0.0025	3.0	0.025	10.0	0.0025	3.0	0.018	7.0
Suspended Solids	0.008	10.0	0.050	20.0	0.008	10.0	0.025	10.0
pH	6.0 - 9.0		6.0 - 9.0		6.5 - 8.5		6.0 - 9.0	
Flow, GPTC***	100		300		100		300	

*PPT = Pound per ton of coke produced (type of coke not indicated)

**PPTC = Pounds per ton of run-of-oven coke produced

***GPTC = Gallons per ton of run-of-oven coke produced

****Need operating data for coke plant effluent

*Carnegie-Mellon University in a report prepared for the American Iron and Steel Institute

TABLE IV

RECOMMENDED GUIDELINES - U.S. PIPE AND FOUNDRY COMPANY

	Level I		Level II	
	#/ton	mg/1	#/ton	mg/1
Suspended Solids	0.096	40	0.096	
Cyanide	0.01	4.1	0.005	
Phenol	0.0004	.167	0.0002	
Ammonia	0.10	42	0.10	42
Flow	300 gal/ton		300 gal/ton	
pH	6 - 9		6.5 - 8.5	

Cost Analysis

In order to attain Level I standards, the following units of operation must be installed at the coke plants:

1. Ammonia recovery units, ammonia destruction units, or scrubbing units to recover ammonia and combine it with dilute sulfuric acid to produce ammonium sulfate as a by-product.

2. Oil Stripping Units

3. Activated Sludge (Revised according to BPT. 95.6% reduction required to attain Level I as recommended in the Rice Report).

4. Oxidation Lagoons (Revised according to BPT. 95.6% reduction required to attain Level I as recommended in the Rice Report.

ESAWQIAC Recommended Limitations

Phenols

The literature cited in the report is conflicting, indicating that the recommended level of 0.1 mg/1 for phenols cannot be attained, although it has been possible on laboratory studies. On the other hand, plant operation tends to indicate that it is possible to attain the 0.1 mg/1 about 90% of the time utilizing biological oxidation. Figure 1 indicates these results.*

The Committee considers that in other plants the 0.1 mg/1 limitation for phenol could be somewhat difficult, and thus recommends a limitation of 0.15 mg/1 for this parameter.

Cyanides

The Committee could not reach an evaluation of the parameter to be recommended for cyanides based on the Rice Report. The four exemplary plants show very high results for cyanides, as reported. However, based on the data contained in Supplement B and the recommendation of one of the industries, the Committee recommends an effluent standard of 4.0 mg/1 for cyanide based on a 300 gallon waste per ton of coke.

Ammonia

There is a great discrepancy as to the effluent limitation for ammonia. While the Contractor recommends a standard of 3.0 mg/1, the literature cited tends to indicate that this figure cannot be attained. The Rice Report could not substantiate it. The exemplary plants show results much higher of the recommended limit. Based on the data in Supplement B and the recommendation from one industry, the Committee recommends a limitation of 40 mg/1 for ammonia.

Suspended Solids

The Committee recommends that the suspended solids limitation be equal to that to be attainable by secondary treatment, which is 30 mg/1.

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* Based on data from Bethlehem Steel Corporation and a plant feed of 410 mg/1 phenol.

BOD

The Committee recommends that the BOD limitation be also equal to that attainable by secondary treatment, or 30 mg/1.

Flow

The Rice Report recommends the use of 100 gal per ton of coke, but none of the exemplary, nor other plants, are utilizing this amount of water. It is possible that these recommendations are based on expected reductions in water usage. Best practical technology at the present time indicates that a normal figure for water usage is 300 gal per ton on coke. The Committee agrees with the recommendations of the industry in this respect, and recommends that all pollution parameters be based on 300 gal per ton of coke rather than on 100 gallons.

pH

The Committee recommends a pH range between 6.0 and 9.0 for Level I.

Nitrates

The reduction of ammonia will result in an increase in nitrates. As well, the use of activated sludge to attain the 30 mg/1 reduction for BOD, or the use of aerated lagoons, will increase the nitrate content. The Committee recommends that no limitation be imposed on this parameter.

Fluorides

The reduction of fluoride ions will require a completely different wastewater treatment, based on chemical precipitation.

Since the fluoride is not a problem in most of the plants, the Committee recommends that this parameter not be included in the guideline.

Summary of ES&WQIAC Limitations

Table V summarizes the recommendations of this Committee for Levels I and II.

TABLE V

ES&WQIAC RECOMMENDED STANDARDS FOR LEVEL I & II

	Level I		Level II	
Parameter	Lb. per ton coke produce	mg/1	Lb. per ton coke	mg/1
Cyanide	0.01	4.0	0.01	4.0
Phenol	0.0004	0.15	0.00027	0.10
Ammonia	0.096	40	0.10	40
BOD$_5$	0.072	30	0.072	30
COD	---	--	--	--
Sulfide	0.0025	1.0	0.00075	0.30
Oil & Grease	0.025	10	0.018	5.0
Suspended Solids	0.072	30	0.072	30
pH	6.0 - 9.0			
Flow	300 gal/ton coke			

LEATHER TANNING AND FINISHING

ES&WQIAC REPORT ON DRAFT DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE LEATHER TANNING AND FINISHING INDUSTRY

BY: STANLEY CONSULTANTS, INC.
#68-01-0590

General

The Effluent Standards and Water Quality Information Advisory Committee, after an evaluation of the report prepared by the Stanley Consultants, the data available and the input obtained during two workshops held with representatives of the industry and interested persons, reaches the following conclusions:

1. The Committee considers that there is lack of data on part of the Contractor to reach the standards recommended. The Contractor depends on the use of activated sludge process to attain Level I. The degree of effluent reduction recommended is much higher than what could be obtained by the activated sludge process.

2. The industry has recognized its responsibility for pollution control, and has established in many cases programs that have substantially reduced the environmental impact in the area.

3. The Committee considers that the effluent guidelines for Level I for the tannery industry should be based on activated sludge, aerobic-anaerobic-lagooning, or another process that may produce a satisfactory effluent.

4. The cost of application to attain Level I appears to be too high for the gross annual sales of the industry, and thus alternating processes should be permitted.

The following comments are presented.

Industry Categorization

The committee considers that the industry categorization as suggested by the Contractor appears logical. This kind of categorization recognizes production variables and allows ready identification of waste loads from each process. The seven categories selected are as follows:

1. Pulp, Chrome, Finish
2. Save, Chrome, Finish
3. Save, Finish
4. Hair previously removed, previously tanned, finish
5. Hair previously removed or retained, finish
6. Pulp, Chrome, No finish
7. Hide Curing, No Tanning, No finish

Pollution Parameters

The Committee considers adequate the pollution parameters suggested, but, will recommend a change as to total chromium. The Committee is of the opinion that since it is possible to request from industry not to use hexavalent chromium in any form, this could be completely banned. The parameter for total chromium should be changed to the trivalent form which is less toxic than the hexavalent. This will permit a higher trivalent chromium level, as the total chromium recommended by the Contractor is considered too rigorous for the industry.

Control and Treatment Technologies

Part of the industry recognizes its responsibility for pollution control and has established programs that have substantially reduced the environmental impact in the areas in and around the tannery operations. In-plant changes have resulted, in some cases, in reduction of the steam flows, and wastewater treatment equipment installed has substantially reduced the organic load going into the receiving bodies of water or municipal sewerage systems.

There are only a few plants utilizing activated sludge systems, only one of which appears to be operating properly. Trickling filtration has been used, in general, the efficiency of operation has been lower than expected. Aerobic-anaerobic lagoons have been used for a large part of the industry that is not connected to the municipal sewerage systems; these lagoons apparently provide a satisfactory effluent in most cases.

Activated carbon, although a technical possibility, have not worked properly, even at laboratory scale. It does not appear possible to reduce more than 80% of the organic constituents in the waste by activated carbon adsorption.

The laboratory tests made by one of the carbon manufacturers have only demonstrated an 80% reduction, (Calgon Report No. C-871, June, 1972). Activated carbon may have limited application in the tannery industry, as the removals are confined to dissolved organics and required extensive pre-treatment.

Advance treatment is non-existent at this time in the tannery industry.

General Comments

The Committee is of the opinion that the Stanley Report should be revised in light of actual plant operations. The following are general comments of the report:

The Committee considers that there are several exemplary plants operating in the country whose data should be studied and evaluated to arrive to the parameters to be recommended for Level I. The Stanley Report does not consider any of the existing plants as exemplary, and arrive at the BPT on technical possibilities and laboratory studies that have not been proved in actual plant operation. The Committee considers that the BPT should be based on the actual plant operation rather than on the technical possibilities of achieving the standard. The suggested parameters appear more logical for Level II or BAT rather than BPT or Level I.

2. The suggested standard is based in Alternative G, or activated sludge process, but only one out of three activated sludge plants in use by the tannery industry has attained 89% efficiency. It should be considered that the high proteinaceous matter in the tannery wastewaters makes it somewhat difficult to attain the recommended level. (98.5% reduction). In addition, there are chromium ions in the waste that might upset the microorganism balance. The batch nature of the tannery operations and wide fluctions in waste flows and waste strength makesit also difficult to attain the standard. Such variances, as indicated in the Stanley Report, can be difficult to handle.

Average BOD_5 in the tanning industry is 1,000-2,000 mg/1, (Moore, E.W. "Wastes from the Tanning, Fat Processing, and Laundry Soap Industries"), while there are specific waste streams with BOD_5 of over 15,000 mg/1 (pg. 29 of the Report). This high organic load would require the design of special activated sludge plants. Pilot studies, as indicated in the Report, are required to establish appropriate design parameters (pg. 79). This has not been done at the present time, thus, there is no design criteria established for this waste. It is of great importance also to consider that the high removals of BOD in the activated sludge process results only at a low F:M ration(pg. 84). However, the high food concentration present in the tannery wastes and the complexity of the proteinaceous molecules of very high molecular weights (up to 500,000) will need a microbiological population with adequate exzimatic processes to obtain their degradation. The low F:M ration required to attain the 98% reduction most probably will not be attained by the recommended method of Alternate C, that is, the activated sludge process.

The Committee does not consider that advance treatment would be BPT for this industry. Because of these reasons, the Committee does not agree with Alternative C as defined in Sect. VIII of the Stanley Report because there are based on activated sludge as a method that does not constitute BPT for several reasons discussed, and certain characteristics of the waste that could upset the microbiological balance as follows:

a. Presence of toxic ions

b. High dissolved organics and organic load

c. High proportion of food to microorganisms that will not permit obtaining a reduction to attain the recommended Level I.

d. No design criteria on activated sludge at the present time, and none suggested by the Contractor.

e. The recommended level is not based on actual plant operation of this industry in particular.

f. Too high operating costs to attain the recommended reduction.

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3. The activated sludge-nitrification-denitrification-reverse osmosis system as suggested by the Contractor is considered out of the question for Level I because of its economic impracticability for the tanning industry.

4. Chemical treatment, or coagulation to remove BOD, sulfides and other constituents, would be of little efficiency. As the organic matter is present in the dissolved state, it does not appear possible to remove up to 90% of BOD as claimed in the Stanley Report (Table VI, pg. 61), unless most of it is in suspended form. The chemical treatment suggested in the Stanley Report is based on laboratory studies by Sproul, et.al., (Jour WPCF-1966). These results were obtained through polymers, pH adjustment and the use of coagulants at a rate of 500-600 mg/1. This is about 50 times the amount of coagulants that should normally be used in water treatment practice. Coagulation of the wastewaters should not be considered as BPT for the tannery industry because of its high operation costs. No one in the industry, in operation, has used this method, probably because of its high cost.

5. The use of aerobic-anaerobic or aerobic lagoons, which apparently are not recommended by the Contractor, but which has been demonstrated in actual plant operation, should be permitted for those tanneries location in rural areas or where sufficient land is available. The literature and plant operation indicates that it is possible to attain a reduction of 92% BOD which is probably more than could be attained by

activated sludge processes. An aerobic-anaerobic lagoon could be designed for a load of 5 lbs. BOD per day per 1,000 cu.ft. according to studies by Sawyer (1968). The lagoons should be equipped with mechanical or floating aerators. This approach has the following advantages:

a. Eliminate most of the nitrogenous matter

b. Is less susceptible to shock organic loads than that of the activated sludge process.

c. Less susceptible to the chromium constituents present in the wastewater.

d. Less expensive

e. Good BOD, suspended solids and COD reductions

f. Lower costs of operation and maintenance

It is considered that Alternative C suggested by the Contractor should include the aerobic-anaerobic lagoons. Reduction in waste stream should be practiced by industry to reduce the use of land.

It is also of consideration that the aerobic biological treatment processes can be seriously inhibited by some tannery waste constituents (pg. 55), and short term high organic concentrations could be detrimental to biological activity. Batch operations practiced by the industry (pg. 56) also would limit the efficiency of other aerobic mechanical processes.

6. The Stanley Report indicates that the trickling filters have had poor experience operation in the tannery industry, citing works by Kinman ("Evaluation of Waste Treatment Process

for Treating Waste" from Bona Allen, Inc., Buford, Ga. 1972). However, plant operation data submitted by the industry indicates that the Bona Allen facility equipped with trickling filters is operating with efficiencies of over 90% in terms of BOD and suspended solids.

7. It is noticed that no data from the three activated sludge plants in operation is included in the Contractor's report. This data should be made available and studied to reach conclusions for Level I technology. It is considered that additional data on plant operation should be applied to reach logic conclusions for the parameters suggested.

8. The Committee recommends that the use of hexavalent chromium be completely prohibited in the tanning industry.

9. The Committee agrees with non-removal of dissolved solids as the process requires the use of relatively high amounts of inorganic salts that are too difficult and expensive to remove.

10. The COD figures should be revised. It does not appear correct that in some categories the COD permitted is 50 times higher than the BOD (pg. 3) while, data reported from plant operations, at least in a waste stream, shows a proportion of 1:2 of BOD to COD (pg. 29). Ratio is closer to 1:3 for the industry.

11. The Committee considers that the combined municipal tannery treatment systems is adequate for BPT for the 60-75% of the industry, while aerobic-anaerobic lagoons or activated

sludge plants should be considered for the rest of the industry. The Committee also considers that because of the high BOD in the wastewaters and nigh dissolved organics and complex molecules, the activated sludge, or secondary treatment, could be of doubtful efficiency in certain cases, and would impose high construction, operation and maintenance costs to an industry of relatively low gross sales. The Contractor should have given more emphasis to the aerobic-anaerobic systems to be selected by the industry as an alternative. Special designs for activated sludge plants should be done, as the BOD load for this in wastewaters is high, thus, requiring large aeration basins and air equipment.

12. The Committee considers that Level I, as suggested by the Stanley Report, does not constitute BPT, and is not representative of BPT. It is notices that one plant, namely, Bona Allen, Inc., Buford, Georgia, provides phico-chemical-biological treatment and cannot attain the recommended guidelines for Level I.

13. The recommended trivalent chromium level is considered rigorous for some categories with major chrome-tanning operations (Categories 1 and 2). As hexavalent chromium could be banned, the trivalent chromium level could be increased, based on a 90% reduction.

14. Most of the companies have established joint treatment facilities with the municipalities for complete treatment, and apparently no operational problems have resulted in these plants

because of high concentration of oil and greases, sulfides, or chromium. The pre-treatment standard should be the one accepted by the municipal sewerage system in each particular location or slightly modify accordingly.

15. The Stanley Report provides some exceptions for process upsets, emergencies such as power failure and other such occurrences, and recommends twice the basic level in 5% of the composited effluent samples during any 90-day period.

The Committee considers that the phrase should be revised as follows:

> "Any parameter except pH can be twice the basic level in 5% of the composited effluent samples during any 90-day period. When emergencies such as power failure or "Acts of God" occur, the effluent limitations would not apply for the period of the emergency."

Actual Operation Practice and Attained Removals

The Committee considers, contrary to the Stanley Report, that there are wastewater treatment plants in the tannery industry that could be considered ememplary, and that in spite of the high organic load in the influent, are attaining what could be considered as a satisfactory effluent according to the best practicable technology. Table I shows the attainable removal levels at these plants.

TABLE I

ATTAINABLE REDUCTION IN CATEGORY 1, 2, AND 3 PLANTS

Parameter	% Attainable Reduction		
	Category 1	Category 2	Category 3
BOD_5	90-95	90	89.4
COD	85	83	75.0
Total Chromium	80-85	87	95.6
Oil & Grease	85	96	--
Sulfide	99	90	98.3
Suspended Solids	80-85	88	85.8

Results based on Summer attainable levels. Lower results obtained during Winter.

Category I - S.B. Foot Tanning Co., Red Wing, Minn.

Category 2 - Armour Leather Co., Bolivar, Tenn.

Category 3 - Virginia Oak Tannery, Luray, Va.

The Committee recommends that the BPT, or Level I guidelines, be those that are being attained at the present time by the best plants in the country, and that the treatment method or methods to be used are not limited to activated sludge. Aerobic-anaerobic lagoons should be permitted in some areas.

Standards Recommended in the Stanley Report

An analysis of the recommended Effluent Limitation Guidelines for the Leather Tanning Industry is contained in Table I.

TABLE II	PARAMETER: BOD 5		PARAMETER: COD		PARAMETER: Suspended Solids	
CATEGORY	Level I** *ELG	% Removal***	Level I ELG	% Removal	Level I ELG	% Removal
1	1.3	98.6	91	65.0	0.67	99.3
2	2.0	97.1	49	65.0	1.0	99.3
3	1.7	97.5	88	64.8	0.83	99.4
4	0.4	98.1	9.8	65.0	0.33	99.3
5	2.5	96.3	60	64.8	1.3	98.5
6	0.67	99.4	82	64.4	0.33	99.7

	PARAMETER: Total Chromium		PARAMETER: Oil & Grease		PARAMETER: Sulfide	
CATEGORY	Level I**	% Removal***	Level I ELG	% Removal	Level I ELG	% Removal
1	0.03	99.3	0.33	98.3	0.003	99.9
2	0.05	00.0	0.5	98.8	0.005	99.4
3	0.04	80.0	0.42	98.7	0.004	96.7
4	0.02	99.2	0.20	97.5	0.002	99.9
5	0.06	95.0	0.62	97.4	0.006	99.9
6	0.02	95.5	0.20	97.0	0.002	99.9

Based on Table 4, Pages 38-39, Stanley Report

* Based on Stanley Report, pg. 38-39

** Effluent Limitation Guidelines

*** % Removal is the Required Removal Level if the Guidelines Levels are attained on a Tannery Raw Wastewater of Average Analysis for Each Parameter

Recommended Parameters

Based on the preceeding discussion and the Public Hearings held with representatives of the industry and analysis of the data gathered at the best plants in the country, the Committee makes the following recommendations for BPT, Level I, as included in Table III.

TABLE III

LEVEL I - SUGGESTED ES&WQIAC EFFLUENT LIMITATIONS GUIDELINES

July 1,1977

SECONDARY

Parameter	CATEGORY kg/1000 kg hide (lb/1,000 lb hide)					
	1	2	3	4	5	6
BOD_5	10.1	15.7	13.4	5.5	19.7	5.3
COD	26	31.0	70.1	20	60	23.0
Trivalent Chromium	0.20	0.32	0.35	0.13	0.38	0.13
Oil & Grease	3.3	5.0	4.2	2.0	6.2	2.0
Sulfide	0.03	0.05	0.02	.02	0.06	0.02
Suspended Solids	8.0	12.0	20.0	4.0	15.6	4.0
pH, units	6.5 to 8.5 (All Categories)					

Basis for ES&WQIAC Level I Limitations

	Stanley Report Reduction in %	ES&WQIAC Recommendations Reduction in %
BOD_5	98.6	89 as attained in best plants
COD	Less than 50%	90- Based on data as reported in Stanley Report, Table 4, pgs. 38-39 and actual plant operations
Trivalent Chromium	99	Complete banning of hexavalent chromium, and additional trivalent chromium, with a removal of 90% at the plant
Oil and Grease	99	90% as attained in best plants in the country (See Table I)
Sulfide	99.9	99%
Suspended Solids	99	88%, as attained in the best plants in the country (See Table I)

Pre-Treatment Standards

Most of the plants discharge into the municipal sewerage system. The Stanley Report recommends Alternative B, Pre-Treatment, for all tanneries discharging into these systems. Alternative B included pumping, screening, equalization and primary clarification, sludge handling, holding tanks, thickening units and dewatering prior to land disposal of the dewatered cake. It is considered that most of the plants do not have the necessary space for the installation of all this equipment, and would therefore have to move to another area. It is considered that it would be a duplication of units and cost to require pretreatment facilities as primary clarification and sludge handling equipment if the effluent is discharged into the municipal sewerage system.

Tanneries located in urban or metropolitan areas where there are no additional facilities should not be required to install this equipment.

In addition, the precipitation of chromates would require vast chemical process units and equipment. It is believed that it is more benefitial to protect the sewerage system by banning the use of hexavalent chromium and permit a higher concentration of the less toxic trivalent chromium to the municipal sewerage system. LEVEL I - Effluent Guidelines for Pre-Treatment are included in Table IV.

TABLE IV

RECOMMEND PRE-TREATMENT GUIDELINES

Parameter	Category KS kg/1000 kg hide (lb hide)					
	1	2	3	4	5	6
Hexavalent Chromium	None	None	None	None	None	None
Trivalent Chromium	0.35	0.35	0.35	0.35	0.35	0.35
pH	6.5 to 8.5 - (All Categories) --------------					

Pre-treatment costs, as suggested by the Contractor, Stanley Consultant, Inc.) would cost about $975,000 in capital costs, $91,000 in operation and maintenance, and $51,000 for power, chemicals and other expenses for Category 1.

Economical Impact

The tannery industry cannot be considered as a highly profitable one. Last year the industry had annual sales of

$835 million. (Categories 1 thru 6). The production has shrunken in the last four or five years, mainly because of the manufacture of shoes in less developed countries where the cost of labor is much lower than in the United States. The competition from foreign countries have been such that the industry constantly is lowering its production and sales. Eighteen (18) plants have been forced to close within the last four years mainly because of the competition from abroad. Several others are in poor financial position at this time.

Ten years ago shoe imports into the U.S. amounted to less than 1% of the total domestic production. In 1972, total conventional shoe imports reached 297 million pairs, or about 54% of the production in the U.S.

The Stanley Report indicates that the cost of achieving Level I guidelines. This would represent 17.4% of the annual gross sales in 1972. Operation and maintenance will increase the finished product cost from 1.8 to 12.4% (pg. 2, Stanley Report), or $104.4 million per year. These construction and operation costs could not be absorbed by part of the industry which will be forced to close when the Level I guidelines are promulgated if the Stanley recommendations are adopted.

TABLE IV

ANNUAL GROSS SALES

Category	No. of Plants in Category	Annual Gross Sales (In Million Dollars)
1	140	470
2	7	84
3	15	122
4	177	62
5	8	68
6	14	29
Converters*	70	
	421	835

* No wastewaters

Annual sales by plants are included in Table V.

TABLE V

No. of Plants	Gross Sales in 10^6 Dollars
1	$40 - 50
1	30 - 40
5	20 - 30
12	10 - 20
22	5 - 10
19	3 - 5
83	1 - 3
256	Less than 1

The Committee considers that the cost of the application of the several technological steps to attain the recommended levels in the Stanley Report are high for the industry, whose gross sales are relatively limited as compared to other industries, and where there are several small industries that could not afford the extra costs. It is noticed that one plant with annual gross sales of $7.3 million would have to invest $1.7 million in plant wastewater treatment facilities to approach the recommended Level I guidelines.

The tannery industry cannot be considered to be a highly profitable business. Some industries are working on marginal profits and may close with the stringent standard should activated sludge become mandatory. For these cases, and for other possibilities, less expensive treatment requirements should be permitted.

The Committee recommends that consideration be given to the gross sales and profits of the industry before applying the guidelines suggested in the Stanley Report, as undoubtedly, it would have a tremendous impact in the survival of part of the tannery industry in the United States.

January 25, 1974

MEMORANDUM

SUBJECT : Leather Tanning

FROM : Effluent Standards and Water Quality Information Advisory Committee

TO : EPA Leather Tanning Discussion Group

ES&WQIAC recommends effluent limitations for all categories in the Leather Tanning Industry as follows:

89% reduction of BOD_5 - 90% reduction of TSS and 90% reduction of Total Chrom. and 90% removal of Oil and Grease.

These reductions are based on expectations of those obtainable in actual practice, using an aerobic-anaerobic lagoon waste treatment system supplied with additional mechanical aeration.

ES&WQIAC recommends the removal of the fecal cliform parameter from the limitation.

Our concern is that the 95% reduction as published in the Register will be so stringent that plant closings will encourage the infiltration of the foreign market already interested in the leather business to further encroach upon the American facilities.

The effluent limitations numbers as suggested by ES&WQIAC are compared with the Stanley report numbers, the Development Document, and the proposed Federal Register limitations as published.

LEATHER TANNING

1. ES&WQIAC recommends effluent limitations for all categories in the Leather Tanning Industry as follows:

   89% reduction of BOD_5 - 90% reduction of TSS and 90% reduction of Total Chromium and 90% removal of Oil and Grease.

   These reductions are based on expections of those obtainable in actual practice using an aerobic-anaerobic lagoon waste treatment system supplied with additional mechanical aeration.

2. ES&WQIAC recommends the removal of the fecal coliform parameter from the limitation.

   Our concern is that the 95% reduction as published in the Federal Register will be so stringent that plant closings will encourage the infiltration of the foreign market already interested in the leather business to further encroach upon the American facilities.

   The effluent limitations numbers as suggested by ES&WQIAC are compared with the Stanley Report numbers, the Development Document, and the proposed Federal Register limitations as published.

ANSWERS

1. EG has already cutback and removed the fecal coliform parameter. They have based their guidelines on new design technology at the S.P. Foot Co. in Red Wing, Minn. and suggest we contact Mr. Bill Martin there for further information on their efficiency. There is another company which is a leather prep treatment business called the Solz Tanning Co. in Santa Cruz, Calif. and the contractor is Norman Lezlo. We were not successful in getting them to consider 90% reduction as Dr. Guzman recommended. They plant to stick with 95%.

January 25, 1974
10:30 AM

MEMORANDUM

SUBJECT : Leather Tanning Industry

FROM : Effluent Standards and Water Quality Information Advisory Committee

TO : EPA Leather Tanning Discussion Group

Prior review of the proposed guidelines resulted in the preparation of statements and questions (see attached) that were presented to EPA Discussion Group in typed form along with verbal suggestions.

Comments on Statements

The promulgated guideline limitations will be about 59% higher than those indicated in the proposed guidelines.

The fecal coliform parameters will be dripped from the guidelines.

The shortage of leather in the world will preclude the take-over of the American market because of higher USA manufacturing costs.

Additional Input

An enforcement policy is being prepared that will cover all industries. Oil and grease has been dropped from the guidelines.

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MEAT PRODUCTS

EFFLUENT STANDARDS & WATER QUALITY INFORMATION ADVISORY COMMITTEE REPORT ON DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES FOR THE MEAT PACKING INDUSTRY

General

The ES&WQIAC has completed an evaluation of the subject document prepared for the United States Environmental Protection Agency by North Star Research Institute. Information available to the Committee in addition to the North Star report included the input at one workshop; the draft report of July 8, 1971 by North Star; back up information on interim guidelines provided by the Office of Permit Programs, EPA; and data on meat product waste treatment studies submitted by the American Meat Institute. The raw sata used by the contractor was not at hand when this review was made. The observation presented below are subject to modification when the raw data is reviewed.

The Committee presents the following comments and recommendations on major sections of the contractor's report.

INDUSTRY CATEGORIZATIONS

The proposed categorization appears to be adequate.

WASTE CHARACTERISTICS

The contractor is complemented on his statistical presentation of raw waste characteristics as such facilitates review. Considering the varied sources of data the Committee cannot determine reliability although review of various sources indicates it is above average. The high variability of flow and pollution parameters suggests the need for further sub-categorization. The contractor however approaches this problem well and presents acceptable rationale and means of meeting this problem on control, treatment and the ultimate guidelines. The significance of overuse of water is well presented and offers a sound means of reducing the variability and total RWL.

POLLUTION PARAMETERS

The pollution parameters are satisfactory.

CONTROL AND TREATMENT TECHNOLOGY

It is agreed that, basic to providing BPT and BAT, intensive in plant control and primary waste treatment are essential.

The presentation on secondary treatment concentrates on established biological processes currently in use and is generally adequate. The performance data of various secondary treatment systems, pages 82 and 83, need to be expanded to provide adequate bases for guidelines. The statistical presentations similar to those made on RWL are lacking in this data. The values are weakened when the results represent only one plant as presented for six of the average values and four of the five exemplary values. Review of the contractors data is needed to determine design loadings, actual loadings, sampling schedules, time of year, temperatures and other germane factors.

As the proposed 1977 guidelines are for 98.5+% BOD removal better documentation is needed.

Tertiary and advanced waste treatment have had little actual application in this industry but includes some established and some developmental processes of promise. Removal of ammonia nitrogen may be the greatest hurdle. The presentation on spray/flood irrigation presents more obstacles than solutions and does not support the postulation of it being a generally accepted means of accomplishing zero discharge.

COST, ENERGY AND NON WATER QUALITY ASPECTS

The cost analyses are quite extensive but are admittedly ball park figures. Time does not permit a more critical review but as time permits the Committee desires to return to some of the cost analyses for re-evaluation. Some questionable areas are manpower for treatment, underestimation of land disposal and lack of cost effectiveness analyses.

BPT

The report does not fully support the effluent quality requirements listed in Table 14 page 123. It is stated that 25 per cent of the plants with secondary treatment, for which effluent qualities were available, are meeting these standards but such is not presented. A 98.5% BOD reduction is required for average waste loads to be reduced to 0.08 Kg/1000 Kg LWK (15 mg/1). Table 6 does not present strong support for this capability. The 1971 guidelines by contrast set values twice this high for Schedule A and nearly four times as high for Schedule B. On the other hand there are exemplary plants results validated and a few reported in the permit system which meet the BOD requirements of Table 14.

The American Meat Institute petitions for due allowance in Table 14 for recognized variabiligy expected in meat industry waste treatment plants with respect to the standard parameters of BOD, suspended solids and pH. A rationale in this respect is presented in the appendix to "Meat Products Industry Guidance and Technical Documentation" by Office of Permit Programs, EPA, dated March 19, 1973.

It is recommended that all data be reviewed with the objective of strongly justifying Table 14 or increasing the levels to more readily attainable levels.

BAT

There is a good probability that most of the parameter limit presented in Table 16 can be met. Continual review of progress in ammonia and Kjeldahl nitrogen removal is indicated to determine whether technology to meet these levels is progressing well enough or whether revision is needed. The writer persists in pushing land disposal while still presenting significant limitations.

NEW SOURCE PERFORMANCE AND PRE-TREATMENT STANDARDS

These are acceptable as written and assume some changes will be made in BRT.

January 17, 1974
3:00 P.M.

MEMORANDUM

SUBJECT : Meat Products

FROM : Effluent Standards and Water Quality Information Advisory Committee

TO : EPA Meat Products Discussion Group

Prior review of the proposed guidelines resulted in the preparation of statements and questions (see attached) that were presented to the EPA Discussion Group in typed form along with suggestions for the consideration of the group.

Comments on the Questions

1. The procedure for the determination of ELWK will be demonstrated and shown by example so that a young engineer can proceed with the preparation of a permit, with directions from the guidelines and the Development Document.
2. Data available to EPA dictated the 1 to 2 ratio for BOD and TSS.
3. The proposed guideline will be changed for grease to a pounds per 1000 pounds of LWK instead of mg/1.
4. The requirement for nitrate control will not be in the promulgated guideline.
5. The 14 to 15 mg/1 requirement for ammonia for new sources is to eliminate a requirement for ammonia for which the present technology is not currently available for this industry.
6. The definition of LWK will be changed to live weight killed instead of number killed.
7. The BAT for High-Processing Packinghouse wastes does not contain an addition for extra hides processed because there is not plant in this category that processes additional hides.

8. For low-processing packhouse, BPT the standards for fecal coliforms will be 400 counts/100 ml in the promulgated guideline.
9. It was reported that there is no significant difference in the wastes from processing the same weight of beef, pork or mutton.
10. It was said that it is not possible to write a permit without the combined information from the guideline and the Development Document.
11. It was reported that it has been found that the only satisfactory way to compute additional loads of hides, blood, etc., is to use ELWK.

Additional Input

The Robert McCall letter of January 14th (attached) to Dr. M. Gager on the subject of the Meat Products guideline along with edited pages from the Development Document were submitted to EPA Discussion for the use and review.

The BPT for large plants may be upped if there is processed meat other than that slaughtered at the processing plant.

The requirements for coliform limits are being reconsidered.

It is probable that there will be some revision in the cost data presented in the Development Document.

January 17, 1974

MEMORANDUM

SUBJECT : Meat Products

FROM : Effluent Standards and Water Quality Information Advisory Committee

TO : EPA Meat Products Discussion Group

1. How does a young engineer determine ELWK?

2. In the simple slaughterhouse and its variations, why are the ratios between BOD and TSS always 1-2 for the additional processes?

3. Why is the guideline for grease 10 mg/1?

4. Why is the guideline for nitrates 5 mg/1 for N.S. simple slaughterhouse?

5. Why do you permit 14-15 mg/1 ammonia in N.S. effluent from simple slaughter houses?

6. Why should the definition of "LWK" live weight" be: the number of animals slaughtered during the time specified?

7. In low-processing packinghouse BPT, why is there no value for fecal coliforms?

8. In BAT for High-Processing Packing houses, why are there no numbers for hides added?

9. Does the guideline differentiate between beef, pork and mutton processing?

10. It is possible to write a permit using only the guideline?

11. Why use 1000#s ELWK for added loads?

Suggestions

1. Explain ELWK in the guideline.
2. Write the guideline so that a permit can be written with the information provided in it.
3. See McCall's letter January 14, 1974 and his edited copy of the "Development Document".

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NON-FERROUS METALS

ES&WQIAC REPORT ON DRAFT DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE NON-FERROUS METALS INDUSTRY -PART I- BAUXITE REFINING

BY: BATTELLE COLUMBUS
#68-01-1518

General

The bauxite refining industry consists of 9 plants, 8 of which were visited by the contractor. All plants are large and may be expanded. They are located in areas of easy land availability. The number of plants will probably not be increased. New plant standards will probably not come into play.

Plant Categorization

All plants use the same basic process with some in-plant modification. Categorization will therefore place all plants in one group.

Waste Characterization

The principle waste is "red·mud" which remains after treatment of ore with caustic or lime and sodium carbonate, heat and pressure. Red muds vary considerably in quantity and impurities which consists primarily of various insoluable metal oxides. Soluable wastes consist mostly of sodium salts and aluminum oxide. COD is 148 mg/1 and pH is 10.5.

Pollutant Parameters

Pollution parameters are alkalinity, pH, suspended solids, and total dissolved solids. From data presented, this list appears to be reasonable. As technology described below makes consideration of specific materials irrelevant, further differentiation is not necessary.

Treatment Technology

No technology is available which will take care of all potential dissolved wastes except total impoundment when different bauxite ores and plant locations are considered. Current state-of-the-art technology makes it possible to recycle process water and impound all solid wastes. Two plants already do this and five impound all red mud and much of other wastes. Alkalinity and pH are taken care of in the "red mud" pond.

Best Practical Treatment

In all cases, best practical treatment is total impoundment of plant effluent since all wastes can be kept out of navigable waters and all plants have adequate land for necessary impoundment. In a few locations where rainfall exceeds evaporation, some variance from no discharge may be necessary. The cost of development of necessary facilities appears from presented data to be acceptable. Actual cost and economic data are thin and subject to further development by industry input.

Best Attainable Technology (Level II)

Best attainable technology is total impoundment and costs are referrable to Level I- Costs.

New Source Performance Standards

The no discharge recommended is logical and attainable at reasonable cost. Availability of bauxite area make it unlikely that new plants will be built in Continental United States.

January 18, 1974

MEMORANDUM

SUBJECT : Non-Ferrous Metals

FROM : Effluent Standards and Water Quality Information Advisory Committee Represented by Dr. Lloyd Smith

TO : EPA Non-Ferrous Metals Discussion Group

1. If there are only nine plants to be considered, why can they not be considered case by case?
2. Why is it necessary to consider cyanide if it is to be limited by toxic substance controls?
3. Does the secondary aluminum subcategory provide for discharges from wet scrubber systems?
4. Have there been any changes in the Economic Analysis Document?
5. Why list solids as "suspended non-filterable solids total"?
6. Why no max. values shown for (c) in 421.32?
7. Why not base 421.32 on aluminum processed?
8. Why not give pH limits in 421.32 as 6.0 to 9.0?
9. Why not give max. values in 421.32 (d)?
10. Why limit aluminum in 421.32 (d)?

BAT no discharge

H.S. (a)" "
(b) discharge from the magnesium process only

11. **Can you explain how BPT is obtained? In the revised development, document five methods which costs were used. (Robert Grieves)**
12. **On what basis of sampling will a 30 day average be calculated? (Lloyd Smith)**

COMMENT ON ESWQIAC EFFLUENT GUIDELINES FOR NON-FERROUS METAL (ALUMINUM)

The proposed effluent guidelines for non-ferrous metals (aluminum) as published in the Federal Register of November 30, 1973 have been examined and the following comments are offered under the subject headings.

Categorization: The division of the industry in three sub-categories, bauxite refining, primary smelting, and secondary smelting, is justified on the basis of product, process, and waste treatment capabilities.

Effluent Limitations (BPT)

(1) Bauxite Refining

Complete impoundment with no discharge of waste water is applicable except as modified by 421.12 paragraph (b). Paragraph (b) should stipulate that all waste water must pass through the process water impoundment without by-pass from any portion of plant site.

(2) Primary Smelting

The significant wastes from primary smelting are derived from wet scrubbers of pot line gases cathode manufacture, and storage of used cathodes. On the basis of the effluents produced by existing exemplary plants and treatment technology available for handling of wet scrubber wastes, the proposed effluent guidelines are attainable by 1977.

(3) Secondary Smelting

Waste water from metal cooling can be recycled or evaporated. The no-discharge limitation is valid. Wet fume scrubbing waste water effluent limitation is attainable.

Effluent Limitations (BAT)

(1) Bauxite Refining

Same as BPT is practical and attainable (no-discharge except as modified by paragraph (b) but may not be economically attainable in two plants.

(2) Primary Smelting

The effluent guideline is based on a technology not now used for removal of residual fluoride from bleed-stream of the wet scrubber recycling system. It is based on analogy with technology in smaller systems. Until demonstration in bleeder of size anticipated from current plant production, fluoride limit should not be as low.

(3) Secondary Smelting

Recommendations are suitable.

Economic Analysis

It appears from economic analysis that two bauxite plants may have to close if they are required to meet the standard. They constitute 24% of industry capacity. In applying BAT to the secondary plants and primary smelting cost will be added and some plant closing in secondary smelting can be anticipated.

January 18, 1974
9:00 A.M.

MEMORANDUM

SUBJECT : Non-Ferrous Metals (Additional Input)

FROM : Effluent Standards and Water Quality Information Advisory Committee

TO : EPA Non-Ferrous Metals Discussion Group

Prior review of the proposed guidelines resulted in the preparation of statements and questions (see attached) that were presented to the EPA Discussion Group in typed form along with suggestions for consideration of the group.

Comments on Questions

1. There was no recorded answer to the question regarding the advisability of considering the nine plants on a case by case basis.
2. The cyanide limit may be dropped in the promulgated guideline.
3. The secondary aluminum subcategory provides for discharges from wet scrubbers by suggesting recycling and treatment of wash waters.
4. There have been changes in the Economic Analysis Document since teams of investigators have visited the Kaiser plants.
5. All guidelines that have a suspended solids limitation will be written with the designation as "suspended non-filterable solids total".
6. There is insufficient daily data available to establish a max. value (c) 421.32.
7. In paragraph 421.32 magnesium is a better base than aluminum processed.

8. The pH range of 7.5 to 9.0 is suggested so that a greater percentage of the heavy metals will be precipitated.

9. Data is not available for establishing max. values.

10. The limit on aluminum gives a satisfactory method for evaluating the treatment process.

11. The Development Document gives the method for the limitations for BPT.

The economic studies for the aluminum refining category are to be considered. Additional work is to be done on the guidelines before promulgation.

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ORGANIC CHEMICALS

August 16, 1973

Report to: Effluent Standards and Water Quality Information Advisory Committee, U.S. Environmental Protection Agency

From: W. Wesley Eckenfelder, Jr.

Re: ORGANIC CHEMICALS INDUSTRY

Because of the wide diversity in products and manufacturing processes, the organic chemicals industry does not lend itself to ready classification. This has been referred to by the contractor and well documented by the industrial inputs to the committee. A proposal is described below which may aid in developing effective guidelines for the organic chemicals industry.

Industrial Categorization

It would appear that this industry can be best categorized in relation to its response to presently available wastewater treatment technology. The primary factors affecting this are:

a. Biodegradability. This can be effectively defined in terms of a K rate which would reflect the rate of degradation of the organics in the activated sludge process. Since the K rate is a function of the waste composition, a chemical complex with a high diversity of products would result in a statistically variable K. The K rate for a given industry would be defined by an appropriate laboratory or pilot plant study.

b. COD/BOD Ratio. This relates to the amount of organics removable by the activated sludge or other biological treatment processes impacts on the effluent quality obtainable by a biological process in terms of both BOD and COD.

c. TDS. Total Dissolved Solids exert a major influence both on the biodegradation rate and the effluent quality in terms of suspended solids. Increasing TDS results in a dispersed biological floc and an increase in effluent suspended solids. This should be factored in in defining BPT or BAT for the particular industry in question.

The organic chemicals industry could be categorized by a matrix of the three parameters above. BOD concentration might also be considered, although there is some question as to how significant influent concentration is as related to effluent quality attainable. For example, for a given wastewater increasing effluent BOD concentrations will result in increased effluent concentrations at the same F/M level. It is possible, however, even with increasing influent concentrations to maintain a given effluent concentration by readjustment of the F/M. It is felt that there is sufficient data available at the present time from operating wastewater treatment plants in the organic chemicals industry, from the published literature, from pilot plant studies and from engineers' reports, to establish a categorization as proposed above.

It is recognized that many organic chemical complexes contain compounds that are toxic or inhibitory to conventional biological waste treatment processes. It is felt that to meet BPT or Level 1 technology, that these compounds would either be removed at their source, pretreated by other technology (e.g., activated carbon), or that an alternative technology such as activated carbon would be employed for the entire waste stream in order to meet Level 1.

Waste Characterization

Waste characterization is divided into three groupings. The first which impinges directly on the wastewater treatment process, i.e., biological treatment. The second that impinges on the effluent quality, but is not necessarily related to the biological treatment process, such as heavy metals. The third considers compounds particular to the waste stream in question, such as phenols.

1. BOD, suspended solids, COD/TOC, TDS, nitrogen, phosphorous
2. Heavy metals (Cu, Ni, Zn, etc.)
3. Specific organics such as phenol, nitrobenzine, toluene, etc.

Control and Treatment Technology

Level 1: It is felt that Level 1 technology should nominally be considered as the effluent attainable from the activated sludge process. Requirements for heavy metal limitations and specific organics or toxicants would require supplementary or pretreatment. In considering activated sludge as BPT, variations in BOD and TDS would result in variations in effluent quality. For example, on one organic chemical waste evaluated it was possible to reduce the COD to 370 mg/l in 0.5 days aeration. Reducing the COD to 275 mg/l required 2.5 days aeration. It is questionable whether this increased reduction is justified in most cases for the cost involved in achieving it. Wastewaters with low TDS levels (less than

500 mg/l) can usually achieve effluent suspended solids levels of 30 mg/l. By contrast, high TDS levels (greater than 5000 mg/l) will usually produce effluent solids levels in excess of 100 to 150 mg/l. Since BPT is nominally assumed as the activated sludge process, there is effectively no reduction in nondegradable organics (COD). Whether this is a problem or not under Level 1 technology should be determined by appropriate bioassay testing. Appropriate bioassay testing can be an integral part of any permit issued.

Variability in Effluent Quality

It is recognized that many factors affect the effluent quality from a wastewater treatment facility. The principal factors are:

1. Variation in product mix which affects the composition of the wastewater and hence, the k rate.

2. Variation in concentration which directly influences the effluent concentration from the biological reaction rate.

3. Variation in other parameters, such as TDS, which could influence the effluent suspended solids.

The degree of variation will depend on the complexity of the chemical plant, variability in production rate, and the geographical location of the plant. In most cases it would be necessary to generate operating data in order to clearly define what this variability might be expected to be. There are techniques available to calculate what the effluent COD will be from any biological treatment process.

WWE/kb

PETROLEUM REFINING

August 1, 1973

Report to : Effluent Standards and Water Quality Information
Advisory Committee, U.S. Environmental Protection
Agency

From : W. Wesley Eckenfelder, Jr.

Re : PETROLEUM REFINING

Industrial Categorization

The API originally classified the refining industry into five classifications (A through E) depending on the complexity of the refining operations. These provided the basis for the entering guidelines. The contractor has modified these classifications to include a B-1 and B-2 subcategory relative to the cracking capacities of the refineries. B-2 are those refineries whose cracking capacities are greater than 50% of the crude capacity. The contractor has omitted "E" classification which seems reasonable. This classification is an improvement as admitted and acknowledged by the refining industry, although with the complexities of this industry further efforts should be made towards a more definitive categorization.

Waste Characterization

The wastewaters are characterized in the report. Certain problems exist; namely, that the number of samples used for the waste characterization in some cases are relatively few. There is a high degree of variability in both volume and strength of the wastewaters. The contractor has further generated for less than 3% in once-through cooling water flow and has used this for a basis in establishing the guidelines. Even under these conditions; however, there is up to a ten-to-one variation in flow (gallons per barrell).

Control and Treatment Technology

The contractor develops in-plant reductions through housekeeping process changes, reuse, etc. and provides pretreatment within the refinery including sour water stripping and spent caustic treatment. Since this is indicated as a basis for BPT and BAT, it would be pertinent to determine which refineries includes in the data analysis presently have sour water stripping and spent caustic treatment. Level 1 treatment is specified as activated sludge with effluent filtration. This is the only industrial grouping that has indicated effluent filtration for Level 1. Serious consideration should be given as to whether this in effect constitutes BPT at the present time. The basis for the contractors' calculations was the mean flow (less than 3% once-through cooling water) and the use of sour water strippers and surface condensers. This leads to a peculiar set of effluent requirements for those refineries having greater than average flow (see the accompanying table). It is felt that only BOD should be specified as Level 1 reductions (BPT), since there appears to be a reasonable degree of variability between BOD, COD, and TOC. Level 2 technology uses a reduced flow with carbon adsorption. There is some question as to whether the refineries presently in existence can reasonably be expected to reduce their flows to the levels indicated by the contractor. The industry was questioned on this point and requuested to provide information to the committee. New source standards use Level 1 technology with the reduced Level 2 flows. This is probably reasonable in this case.

General Comments

It would appear from the data available that even with the revised categorization of the industry there is a high degree of variability in flow and raw waste loading from the various refineries. This undoubtedly reflects both the product mix, the character of the crude, the output product and the internal technology. When applying this classification and establishing effluent guidelines based on average flows, some numbers result that are unattainable by any technology know today. While the contractor does provide variability characteristics in effluent quality, further definition and breakdown of these are needed relevant to effects within the refinery itself, temperature effects on the biological process, etc.

LEVEL I

Category A		Flow = 12	Flow = 90 mg/1	
	BOD	1.5	15	2
	COD	5.6	56	7
#/1000bbl crude	SS	1.0	10	1
	Phenol	0.01	0.1	0.013
Category B-1		Flow = 17	Flow = 61	
	BOD	2.1	15	4
	COD	17.5	124	34
	SS	1.4	10	3
	Phenol	0.014	0.1	0.028
Cagegory B-2		Flow = 21	Flow = 230	
	BOD	3.4	19	2
	COD	26.8	153	14
	SS	1.8	10	0.9
	Phenol	0.019	0.1	0.009
Category C		Flow = 25	Flow = 66	
	BOD	3.2	15	6
	COD	16.8	81	31
	SS	2.1	10	4
	Phenol	0.021	0.1	0.038
Category D		Flow = 37	Flow = 52	
	BOD	4.6	15	11
	COD	42.5	138	98
	SS	3.1	10	7
	Phenol	0.031	0.1	0.071

LEVEL 2

Category A	Flow = 7		mg/1
	BOD	0.29	5
	COD	0.82	14
	SS	0.29	5
	Phenol	0.001	0.017
Category B-1	Flow = 11		
	COD	0.46	5
	COD	2.8	31
	SS	0.46	5
	Phenol	0.002	0.022
Category B-2	Flow = 14		
	BOD	0.58	5
	COD	4.5	39
	SS	0.58	5
	Phenol	0.002	0.017
Category C	Flow = 15		
	BOD	.63	5
	COD	2.5	20
	SS	.63	5
	Phenol	.003	0.024
Category D	Flow = 31		
	BOD	1.28	5
	COD	8.9	34
	SS	1.28	5
	Phenol	0.005	0.019

January 25, 1974
1:00 A.M.

MEMORANDUM

SUBJECT : Petroleum Industry

FROM : Effluent Standards and Water Quality Information Advisory Committee Represented by Eckenfelder and Don Bloodgood

TO : EPA Petroleum Discussion Group

These questions arose during the conference:

1. Why was filtration added to activated sludge for the Petroleum Industry and not to other industries which also are categorized through BOD_5?
2. Are these BPT's being put under water quality limiting areas only?
3. How do you account for the major discrepancies between the numbers and the development document and the Brown and Root report? (API)
4. Can these numbers be met by a reasonable section of the industry?
5. Can we clarify the dri/wet analysis differential in the two reports and how do we account for the cost differential in the two reports.

Additional Input

How will enforcement agencies know that high results are not being discarded in averages? This is a problem that is being worked on.

PLASTICS AND SYNTHETICS

January 17, 1974

MEMORANDUM

SUBJECT : Plastics and Synthetics

FROM : Effluent Standards and Water Quality Information Advisory Committee Represented by Don Bloodgood and Wes Elkenfelder

TO : EPA Plastics/Synthetics Discussion Group

Questions

1. Does the proposed guideline take into account the fact that the character and composition of a waste are reflected in the treatability of the waste?
2. Is the Federal Register publication (pgs. 28194, 28195 and 28196 of October 11, 1973) the proposed guideline?

Suggestions

1. It is suggested that the results of the matrix method of evaluation be used in the demonstration of the variability of these waste in treatment processes.

July 16, 1973

Report to: Effluent Standards and Water Quality Information Advisory Committee, U.S. Environmental Protection Agency

From: W. Wesley Eckenfelder, Jr.

Re: PLASTICS AND SYNTHETICS INDUSTRY

Industrial Categorization

The industry is classified into four categories based upon the raw waste load and the treatability. While in principle this makes sense, the basis for selecting the categories is questionable. The treatability information was apparently drawn from Table 15, page 98 of the report, which summarizes data from twelve wastewater treatment plants. The basic problem arises from the fact that these plants are a mixed bag of treatment processes, organic loading, and plant operation. It is not felt that a real fix on treatability can be derived from data of this type. It is further noted that for Level 1 guidelines, Categories A and B indicate a BOD_5 to average 15 ppm. This would imply a soluble BOD considerably under 10, which is questionable from any biological treatment process. Category C indicates an average BOD of 45, and Category D an average BOD of 75. Both of these numbers appear high as a long term average for wastes of this type. Guidelines reported for suspended solids are technically indefensible. Referring to Table 27, page 151, effluent suspended solids are tabulated for the various plants studied. Only one of the tabulated numbers is below 30 ppm, and yet the writer indicates that "the 30 ppm monthly limit should be achievable by these plants". There is no technical or operational data in the report to justify these conclusions. The phenol guidelines indicate a range from 0.2 to 10 ppm from biological treatment systems. Experience has indicated that any biological treatment system efficiently and effectively operated would reduce the phenol to levels in the order of .1 to .3 ppm. It is felt that the metal concentrations in the report are also inordinately high.

Waste Characterization

The writer of the report indicates that no correlation exists between flow and production levels, and hence intuitively develops guidelines based on concentration. This tends to defeat the goals and objectives of the EPA industrial guidelines program; namely, that credit is given for in-plant reductions of flow, strength, etc. It is the understanding of the Committee from information brought out at the last workshop that this is being corrected internally by EPA. A comment may be further made referring to page 23 of the report where "the treatability of the waste is influenced by the raw waste loading and usually specifically by the influent concentration associated with that load". This statement is totally untrue and unfounded, since treatability is a reflection of the character and composition of the waste, not the concentration. The only conclusion that can be drawn is that the persons writing this report have little or no knowledge of wastewater treatment processes, particularly those involving industrial wastewaters.

Control and Treatment Technology

The report primarily bases its development of treatability and its development of wastewater treatment processes on Figure 26 which plots the BOD removal as a function of total system residence time. This figure and this approach is technically indefensible, since it takes no cognizance of the variability in biological solids concentration and includes various types of processes which are technically incompatible with each other.

Levels 2 and 3 guidelines are also indicated in the report based upon COD (100 mg/1) and suspended solids of 5 mg/1. No data is given in the report to justify these numbers, particularly that of the COD. The same objection can be raised in reporting the effluent guidelines in terms of concentration. Cost effectiveness curves are not given in this report. Data is given in tabular form in the report for effluent variability, i.e., monthly, weekly and daily, although support for these numbers does not appear. In general, the conclusion can be drawn that this report was prepared by persons generally unfamiliar with industrial wastewater treatment processes. The report should be reworked in light of the technical realities of the problem.

January 17, 1974

MEMORANDUM

SUBJECT : Plastics/Synthetics Industry

FROM : Effluent Standards and Water Quality Information Advisory Committee

TO : EPA Plastics/Synthetics Discussion Group

Additional Input

Changes to be Made

1. COD for Level 3-N.S. being adjusted so that BOD is the control.
2. N.S. 120 mg/1 instead of 100 mg/1 for BPT-S.S.
3. As TDS increases, the S.S. increases
4. Attempting to take care of the unusual situations

PLASTICS AND SYNTHETICS

(Industry Input)

Union Carbide Corp.
S. Charleston, W. Va.
Report "Wastewater Recovery and Reuse in a Petrochemicals Plant"
submitted to ES&WQIAC Comm. 4/30/73
CM#2

Union Carbide Corp.
submitted revised presentation
ltr. dtd. 6/12/73 as presented
at Purdue Univ. Workshop

Union Carbide Corp.
S. Charleston, W. Va.
Ltr. 7/20/1973 re: draft dev. document
w/comments-attachment report

Manufacturing Chemists Assoc.
Wash., D.C.
Ltr (no date) re:draft dev. document
for industry and comments (technical)-
meeting held 7/23/73 CM#2

Commentary-by C.E. Steinmetz
dtd. 7/20/73-on effluent guidelines
for industry

Borg-Warner Corp.
dtd. 7/10/73 by: D.M. Robinson
report on "draft dev. document"

Memo: Rohm & Heas Co.
Phila., Penna.
re: discussion and approach to draft dev.
document in industry-dtd 7/16/73

U.S. Industrial Chemicals Co.
New York, N.Y.
Ltr. dtd. 7/13/73 re: draft dev.
document for industry w/comments
meeting held 7/5/73

Hercules, Inc.
Wilmington, Del.
Ltr. 7/27/73 re: comments on draft
dev. document

Scientists' Committee for Public
Information, Inc. Ltr. 7/30/73
encl. draft dev. document for
"Plastics and Synthetics" (review and comments)
and "Addendum"

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PULP, PAPER AND PAPERBOARD

COMMENTS ON EFFLUENT LIMITATIONS GUIDELINES DOCUMENT FOR THE PULP, PAPER, AND PAPERBOARD INDUSTRY

Specific Comments on Contractor's Draft Report

Because the contractor's report is to provide the basis for the effluent limitations, and because the report itself has some deficiencies, considerable ambiguities, and makes some statements which are of questionable accuracy, it seems important to comment on these points in the report itself, prior to evaluation of the recommendations. Page numbers refer to pages in the contractor's (Wapora's) report, dated June 1973.

Page 3, para. 2: This paragraph states that the "allowable pounds of pollutants per ton" may be adjusted to reflect variations in performance as the result of several variables such as raw materials and ambient air temperature. But no specific proposal is made anywhere in the report as to how these adjustments are to be made.

The definition of "production capacity" is not clear. Output in the industry is defined as jumbo roll of air-dry paper (where no converting is involved). This is after triming and rewinding, i.e., the production of "broke". The amount of broke produced in producing a ton of air-dry paper, jumbo roll, is a function of the paper machine design and the product being made. By implication the contractor apparently is defining production capacity as gross paper machine through put. This definition is relevant in the sense that the total RWL from the paper machine operation is in fact a function of machine throughput. However, it is not clear that the industry tabulates such data. Because of within day variations in product output, such as grade of linerboard, and operating problems normally encountered, the proportion of broke produced varies, and can vary substantially. The paper mill is more concerned with its final output, correctly or not, than it is with the intermediate output, i.e., gross machine throughput. Thus it is doubtful if what the contractor apparently proposes is operational. (In fact, in the next paragraph it states that the values are to be related to pounds per ton of product. This is one of many inconsistencies in the report. As indicated, "product" in the industry is defined as the jumbo roll of air-dry paper.)

Page 5: The recommended new source standards are lower than those for best available technology. Assuming that new sources are defined as plants to be designed subsequent to the establishment of the guidelines for BPT and BAT, it is difficult to understand why the effluent limitations for new sources are less stringent than those for BAT.

For comparison with the contractor's proposed numbers for BPT and BAT, the attached Table 1 is included. The contractor's report does not provide substantiation for the selection of the values for unbleached kraft.

Page 9, top: The discussion of the data base for the report is general. No indication is provided of the extent of sampling in the 12 mills in which sampling was undertaken. Further, there is no indication of the extent of data available from the other sources indicated, i.e., type and frequency of sampling, period of record.

Page 17, Figure 3; Page 23, Figure 6: These figures are confusing. It is difficult to follow the product flow and the effluent streams. It would be far better if consistent procedures for such diagrams were used throughout, such as showing all inputs of raw materials at the top, inputs of steam and water at the left, product flow moving vertically down the page, and residuals resulting from the various operations to the right.

Page 24, para. 5: A ratio closer to 4:1 is required to enable absorbing essentially all of the NSSC spent liquor into the kraft process.

Page 21: This figure is inadequate. It does not show the various sources of trim and broke--couch trim, fiber from saveall, broke (after dryers), and rewinder trim, and the resulting disposition thereof, i.e., back into the system.

Page 25: Figure 7 implies that there are no residuals from the spent liquor recovery system. This is an oversimplification.

Page 30, discussion of rationale for selection of subcategories with respect to raw material: the statement that types of wood utilized have minor impacts on raw waste load characteristics (RWL) is not completely valid, even with respect to unbleached kraft. One reason is that in the southeast turpentine is typically produced in kraft operations, whereas in the northwest this is not the case. The difference reflects the type of raw material used, i.e., pine vs. Douglas fir.

Thus, it is highly likely that there are significant differences in RWL depending upon whether or not byproducts are produced, which depends in turn on type of raw material. Similarly, the discussion of the effect of raw material in waste paperboard production is inadequate. Not only do raw wasteloads from the manufacture of paperboard from waste paper differ "widely" from those from any of the pulping processes considered, but they also differ widely among waste paper operations, depending on the type of raw material used. Much larger raw waste loads, in terms of suspended solids and BOD, result from the use of No. 1 Mixed waste paper and mixed book and magazine waste paper than from used corrugated containers and used newspapers. Differences are sufficient such that additional subcategories might well be logical.

Page 31, top: This first sentence does not seem to be consistent with the statement on the previous page. It states, "dissimilarities in production processes relate primarily to the differences in raw materials utilized and end-products manufactured." However, the previous page (next to the last paragraph), states, "process differences among the various pulp types relate primarily to the preparation, use, and recovery of the cooking liquor".

Page 31, products produced: The paragraph states, "Section III discusses in considerable detail the wide variety of products produced." However, all that is done in Section III is to list the various types of products included in the

Standard Industrial Classification under the categories unbleached kraft, NSSC, and waste paperboard products. There is no discussion of product specifications which must be met in the production of these products. Similarly, there is no discussion of the extent to which such specifications affect raw waste load. The statement is simply made that these products, and by implication the specifications therefor, do not produce significant variations in RWL. There is no substantiation of that statement whatsoever.

Page 34, para. 1: The text states, "most of the pulpwood used in the United States is small in diameter and is barked dry in drums." But no data are provided to substantiate this statement. Further, it is stated that wet barkin[illegible]s declining. But there is no indication of whether this is an absolute or a relative decline. There appears to be no change in the use of hydraulic barking as the dominant method in the Northwest.

Page 35, Table 3: This table is typical of tables throughout the report, in which no source of data is given and no indication is made of whether or not the numbers reflect a single grab sample from each mill, one 24-hour composite, the mean of many daily composited samples. The same problem is relevant to Table 4, Table 5, and other tables throughout. This deficiency reflects on the question of the data base used in the report, as noted in the comment on page 9.

Page 36, para. 4: The text states, "BOD values are also greatly affected by the specie of wook barked and the season in which the wood was cut" (emphasis added). Yet, on page 30, the statement was made that type of wood utilized has minor impact on raw waste load. Which is the valid statement?

Page 4, para. 4: What is "final effluent"? Does this mean RWL? Discussion up to the present in the text has related to RWL.

Page 41, para. 5: The statement is made here, and elsewhere in the report, that as flow is reduced, the raw waste load is similarly reduced. Specific numbers are provided in this paragraph from a few mills (using numbers of significant figures which are absolutely unjustified). However, if the data in Table 6 are actually plotted, as shown in the accompanying Figures I and II, the definitive statement of a direct correlation between gallons per ton and pounds of waste load (BOD and TSS) per ton is not substantiated. (Incidentally, no indication is given in Table 6 of the bases for the numbers shown, i.e., no. of samples of what type). Both Figures I and II show a wide scatter for the available data. Although a least squares regression analysis might indicate a slight slope, the correlation coefficient would be extremely low. Thus the flat statement that reduction in water use per ton is accompanied by a reduction in raw waste load generated per ton, is not substantiated in the report.

The explanation probably is that there are other factors influencing RWL, which factors are not in fact reflected in the single independent variable, degree of water use.

Page 48, top: Turpentine is typically nor recovered in kraft operations in northwestern United States.

Page 48, last para.: Here again, the flat statement is made that reduction in water utilization results in a reduction in raw waste load. But no data are presented to substantiate this statement. In contrast to the statements on NSSC and waste paperboard mills, for which explicit data are provided on gallons of water per ton and BOD and TSS waste loads per ton in Table 6 and Table 7, no similar data are provided for unbleached kraft mills. Figure III is bases on data from the 1971 Wapora report. Unfortunately, the data therein were in terms of total flow, rather than gallons per ton. However, the purported relationship should be reflected in those data as well. As Figure III shows, there is considerable scatter with no definitive relationship. A least squares regression for BOD would probably show a relatively small slope, but one which would not support the flat statement made in various places in the text.

Page 50, para. 2: The bases for the data presented in Table 7 are not indicated. Are these mean or median figures? What are the number of samples, frequency of sampling, period of record?

Page 50, para. 3: The contractor states that no subcategorization of waste paperboard mills is necessary. However, this paragraph indicates a major factor which influences the quantity of waste water generated. The restrictions imposed in the production of foodboard are such that substantially larger quantities of water are necessary. This suggests that it would be logical to subcategorize the industry by type of product, having a separate category for foodboard and another category for all other types of paperboard.

Page 50: Discussion of the effect of raw material on raw waste loads in waste paperboard mills in inadequate. Although most waste paper mills use a mix of types of waste paper, nevertheless it is possible to analyze in more detail the implications of raw materials on raw waste loads generated. For example, an unpublished study by Resources for the Future shows that suspended solids generated (RWL) per ton in producing boxboard varies from about 700 pounds per ton with 100% Mixed book and magazine paper as raw material, to about 300 pounds per ton for 100% No. 1 Mixed, to about 100 pounds per ton for 100% waste paper as raw material. This is virtually a 7 to 1 range. The range in BOD generated is substantially less, the figures being about 55 pounds, 40 pounds, and 30 pounds per ton for the three types of raw material indicated.

This differentiation is important in relation to the question of the extent to which paper residuals generated in society can be "recycled". By imposing very stringent standards on SS per ton for waste paperboard mills, utilization of lower quality raw materials, such as mixed book and magazine paper, will be discouraged, thereby insuring that this material will have to be disposed of by landfill and/or incineration.

Figure IV is based on the data presented in the 1971 Wapora report, and is relevant to the statement in the text that RWL for waste paperboard mills is reduced as water use is decreased. Although based on total flow, the only data available, the figure suggests the purported relationship is not substantiated for waste paperboard mills, either for BOD or TSS.

Page 54, last three paragraphs: This discussion of impacts on water system because of dry end breaks, is useful, but incomplete. No indication is given of how often such breaks tend to occur. The frequency of breaks is primarily a function of machine speed and type of product being produced. Perhaps more significant is the fact that on modern Fourdrinier machines, the standard procedure increasingly is to make grade changes without stopping the machine. This means that for some period of time all of the output is wasted to the broke system, to be returned subsequently to the paper machine. In total, change of grade probably is responsible for more water use in this context than dry end breaks. For example, taking a product output of 480 tons per day, or 20 tons per hour, a 15-minute grade change would involve on the order of 5 tons of broke. At 6% moisture off the machine, the amount of water to dilute the paper to one quarter of one percent consistency is about 500,000 gallons. The report should give much more attention to this problem, which can be handled quantitatively, than to the break problem, although the break problem can also be handled quantitatively by using performance records which are available from most mills.

Page 54, last paragraph: A standard procedure in some --- perhaps many --- waste paper mills is to provide temporary storage in tanks for just such problems. This does not represent a major investment or operating cost.

Page 57, para. 3: The lack of validity of the general statement concerning the direct relationship between effluent flow and raw waste loads has been pointed out previously. The evidence cited in the text, i.e., use of only two different mills, with no discussion of the other factors which affect raw waste load, is certainly not adequate substantiation of the generalization.

Page 62, middle: No data are provided to substantiate the statement that dry barking of wood is the most common procedure. This statement may be true in terms of a regional analysis, i.e., in the southeast as compared with the northwest. It may also be true with respect to a criterion such that more than half of the total wood debarked in the U.S. is done by a dry process. But no basis for the statement is provided.

Page 62, next to the last paragraph: The extent to which chips comprise the raw material, rather than wood, is not indicated. In the Northwest about 75 to 80% of raw material input to pulp and paper manufacture consists of wood residues; in the Southeast the figure is around 20%. But in the Northwest at least, some significant portion of the wood residues is from the same plant site, because of the integration of wood products operations --- saw mill, plywood, et al --- with pulp and paper manufacture. Consequently, debarking is still performed at the plant site, but the residuals generated therein may be allocated across all products.

Whether or not more wood will be delivered as chips and less as roundwood in the future depends on a number of factors. For example, the pressure to utilize more of the tree tends to reduce chipping in the woods, so that the bark can be used at the mill. Pulping without barking, already successfully tried in at least one operation, would result in less wood delivered as chips. Whether or not the environmental impacts of chipping in the woods are greater or less than, or about the same as, debarking and chipping at the mill, is not clear.

Page 63, next to the last paragraph: If spills, overflows, and washups occurring when the production process is not in equilibrium are as significant a problem as implied by this paragraph, then it would appear logical that more effort should be made to quantify the actual importance of these activities. A fourth factor, mentioned earlier, should also be included in such analysis, namely, the change in grande phenomenon.

The discussion on page 65 of practices to minimize non-equilibrium losses in excellent and very relevant. The only limitation is that there is no discussion of grade changes as a "non-equilibrium" phenomenon. If in fact, these non-equilibrium situations are as predominant as indicated, for unbleached kraft as well as for the NSSC processes, then the extent of variability in raw waste load attributable to these factors should be determined more definitely.

Page 67, next to the last paragraph: What other "subcategory grades" are involved, in addition to corrugating medium? The NSSC process is used almost exclusively to produce that particular product.

Page 69, para. 2 (middle): The text states that it is industry-wide practice to recycle all primary clarifier sludge back to the process. This is not supported by any data presented. Further, it is not supported by information from the industry. This practice is possible only when the plant was designed specifically to use this procedure and when producing certain kinds of paperboard products.

It is not clear that the primary clarifier effluent is the most logical and equitable location at which to measure the raw waste load. This is particularly the case because the quantities of residuals per ton of input to the primary clarifier vary substantially, depending particularly on raw materials used as well as on the final product being produced.

Page 70, top: The implication of this paragraph is that it is only new mills in which nearly complete process water recycle is possible. There are some very old mills in which the water system has been closed, and in some cases the sludge from the primary clarifier returned to the process.

Page 70, para. 2: The concern with concentration is irrelevant. In terms of impact on the water body, it is total pounds of material discharged which is significant. Thus, high concentrations of dissolved solids in very small volumes mean the same pounds of solids discharged as large volumes with lower concentrations.

Page 70, next to the last paragraph: The extent to which raw waste loads respond to biological treatment for this category is a function also of the nature of the raw materials used. When the raw material involves substantial amounts of publication grade paper, as in magazines and books, the large amounts of very fine material --- from fillers and coatings --- are not amenable to as high levels of removal in both physical and biological treatment as for other types of raw material.

Page 70, last paragraph: Reuse of process water is only one factor. It may or may not be predominant, because both the type of raw material used and the final product affect the raw waste loads and the "treatability". No reasons are presented as to why pounds per day is a more relevant measure than pounds per ton of product.

Page 73, paragraph 3: Ninety five percent removal is difficult, if not impossible to achieve, with certain types of waste paper raw materials. This has been noted above.

Page 73, para. 4: These percentages appear to be somewhat low. Data from unbleached kraft mills suggest that the removal in the primary clarifier is closer to 30%.

Page 84, Figure 20: Pressing and combustion in hog fuel boiler should also be shown.

Pages 87-102: Very extensive discussion is given only to end-of-pipe modification or treatment for handling the color problem. No attention is given to such potential alternatives as oxygen pulping. Considering the very high cost of lime treatment, it is logical to devote more attention to alternatives in terms of process technology.

Page 133, para. 2: Why should the "more expensive combination" of processes be considered in determining costs? The opposite should be the case, i.e.,the least cost system should be determined.

Page 135, Table 24: This table is not clear. First, the fact that the costs relate to August 1971 prices should be explicity indicated on the table. Second, the rate of interest used to ranslate investment cost into annual cost should be indicated. Third, energy costs should be included in the operation and maintenance costs. According to page 134 these costs are shown separately on the following Table 25. Although it is useful to have energy costs separated, they should be shown on the same table as the remainder of the costs. Fourth, it should be noted that these costs are maximum costs because they apparently consider waste treatment only; in-plant process changes are not explicitly included. Fifth, because the table should stand by itself, it should be clear that the costs under the two columns, i.e., I and II, are independent. Each represents the total cost to achieve the specified level. Column II does not represent incremental costs. Column II may or may not include many, all, or some of the same units as for Column I.

Page 137, para. 1: The statement in this paragraph is not completely correct. Although few waste paperboard mills generate electrical energy for their own use, significant numbers of unbleached kraft mills do. Thus, to the extent that energy is generated at the mill for purposes of modifying liquid residuals, i.e., waste treatment, then gaseous residuals are generated on the site atributable to that "external treatment". Generally the quantities of particulates and sulfur dioxide generated per ton in waste treatment are small in relation to the total produced in fuel combustion for energy and steam generation for use in the process itself. However, at very high levels of waste removal, for example perhaps BAT and certainly "zero discharge", the quantity of energy required and hence the gaseous residuals generated to become significant.

Page 141: The discussion of by-product recovery should be made more explicit in terms of variation with geographical location. Turpentine is typically not recovered in the Northwest, because of the predominance of Douglas Fir as the raw material. Failure to note this fact shows lack of understanding of the industry.

Page 142, para. 4: Whether or not the production of by-products such as methanol, acetic acid and tars, is economically feasible is not relevant. Even if there is a net cost associated with the production of these by-products, such production may still be the least expensive way of reducing the BOD discharge.

Pages 137-142: Similar to the failure to quantify the amounts of gaseous residuals generated in waste treatment, there are no data presented on the quantities of sludge which must be disposed of at the different levels of effluent limitations. Such calculations at a minimum could have been done, regardless of the fact that the cost of disposal of the sludges varies substantially depending on the situation.

But it should be noted that it is not clear in Table 24 whether or not sludge disposal costs are included in the cost figures given. Furthermore, it would be far more useful to have data on costs per ton of product output than simply in terms of total annual costs. This is particularly true where any analysis to assess the economic implications on the industry of controls is to be undertaken.

Page 158: These cost data are misleading. They appear to represent costs for a "grass roots" plant. As indicated in the text, "most mills have already carried out many of these improvements". Consequently, these costs should be labeled as maximum or as relating to plants which had done nothing. More relevant information for decision-making would be to show incremental costs over and beyond the existing situation, which could, at a minimum, be assumed to include primary treatment at essentially all mills.

Page 164: The same comments as above relate to the costs shown on this page.

EVALUATION OF CONTRACTOR'S REPORT

Industry Categorization

The categorization is inadequate with respect to the waste paperboard section. At a minimum, food board should be separated from other board. Thus, there would be a minimum of two subcategories for waste paperboard.

In addition, it is recommended that consideration be given to establishing two further subcategories under "other waste paperboard", relating to the types of raw material used. Less stringent effluent limitations could be imposed on mills which used, as raw material, for example, 50% or more No. 1 Mixed and Mixed Book and Magazine waste paper.

The contractor does not justify excluding the raw material variable as a criterion for establishing subcategories either for unbleached kraft or waste paperboard, particularly in view of the several statements made about the significant impact of raw material on RWL.

RWL Characterization

The parameters used to characterize the waste loads for the industry are logical. However, virtually no data are presented on the variability of raw waste loads for the different categories. The text cites different numbers for a few different plants, but does not have any discussion of variability within a single plant, other than in very general terms. That this is an important problem is reflected in the simple data shown in

Figure 5. This data is from one plant with a mean daily production of around 360-365 tons, using both NSSC pulp and waste paper pulp as furnish. The ratio of the average daily production in the maximum month in the thirteen month period of record to the average daily production in the minimum month in the same period was about 1.15 to 1. In contrast, excluding both the maximum and the minimum months in the period, the ratio of the pounds of BOD per ton in the next to the maximum month to the pounds of BOD per ton in the next to the minimum month is over 2.0 to 1; the same is true for suspended solids per ton.

No suggestions are made by the contractor as to how variability might be considered in establishing effluent limitations.

RWL Removal Methods and Costs

Discussion of waste discharge reduction methods is reasonably complete, except that the costs should be clearly labeled maximum costs because of their including essentially only waste treatment, and because they do not allow for facilities already in place.

No cost-removal functions are shown. Rather, there are two points relating to two levels of removal.

Other Environmental Impacts

The effects of liquid residuals modification on air pollution is not detailed. Additional energy required is shown, but not the fact that this would involve generation of sulfur dioxide, particulates, and oxides of nitrogen in combustion of fuel at the mill. Similarly, the quantities of solid residuals --- in terms of sludge generated at each level --- are not indicated.

BPT/BAT

The numbers appear reasonable, except that modifications should be made to reflect at least a separate category for food board. In addition, consideration should be given to establishing two further subcategories under "other waste paperboard" to reflect type of raw material input. Also, explicit consideration should be given to how variability should be handled in establishing effluent limits.

New Source Standards

There is no justification for permitting less stringent standards for new sources than for existing sources in relation to BAT. Thus, the new sources should be required to meet at least the effluent limitations specified for BAT.

RUBBER PROCESSING

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE RUBBER PROCESSING INDUSTRY

BY: ROY F. WESTON, INC.
# 68-01-1510

General

The Effluent Standards and Water Quality Information Advisory Committee has completed an evaluation of the draft of the subject document prepared for the Environmental Protection Agency by the Effluent Guidelines Division.

The Committee presents the following comments and recommendations and they follow the outline in the RFP given to the Contractor.

The Weston Report on the rubber tire and synthetic rubber industry has been prepared in accordance with specifications and in general has been well documented. The Contractor uses background data based on visits to nine (9) tire and tube plants and eight (8) synthetic plants supplemented by data from permit applications and literature sources. Data have been assembled so that comparison are easy. In view of time constraints, a reasonable body of information has been assembled from which to draw conclusions. Principal deficiencies are in BAT specifications as noted below.

Industry Categorization

Categorization of industry is based on separation into two major areas, tire and tube and synthetic rubber production. The separation is logical on the basis of waste load differentiation and treatment capability. Tire and tube is subcategorized on the basis of age and separation is significant primarily for treatment cost projection. The synthetic category is subdivided into three segments depending on process, waste load, and effluent characteristics.

Waste Load and Pollution Parameters

Pollution parameters in tire and tube industry are primarily suspended solids and oil. Other wastes are incident to auxiliary water use, and in most cases are or can be segregated from contact waste waters. In the synthetic industry, significant pollution parameters are COD, BOD, suspended solids, and oil and grease. The primary deficiency of the presented data is no showing of variability within plants. Variability between plants is high especially in COD. Other wastes (TDS, pH, surfactants, and color) are present in very low concentrations; are neutralized in plants; or removed with treatment for other wastes. The stated pollutants are the significant ones to control.

Control and Treatment Technology

Available treatment technology for tire and tube industry wastes includes sedimentation, lagooning, and oil separators. In-plant sanitation can eliminate a large part of wastes with water recycling of process wastes practical in some plants. In the synthetic industry, demonstrated treatments are available for attaining Level I goals. They are practical and in use. Removal of COD is difficult but present exemplary plants are capable of meeting requirements of Level I on this parameter.

No data are presented to indicate any technology now in use which would meet Level II requirements as set forth in the report. The report has a good discussion of practical technologies now in use in exemplary plants.

Best Practical Control Technology - Effluent Limitations

Best practical technology for tire and tube industry is elimination of soapstone and latex dip discharge, segregation of process and auxiliary water, and treatment of oily waste streams. These are attainable by within-plant changes. The proposed limits are reasonable and attainable for Level I. Technology for synthetic plants, although varying among the subcategories, will attain recommended Level I effluents which have a high COD. Present technology is most efficient for COD removal in solution crumb rubber and about half as effective in emulsion crumb rubber and latex plants.

Best Available Technology

In tire and tube industry, best practical and best available technology are the same and can reach Levels I and II. In branches of the synthetic industry, Level II treatment will be directed at reduction of COD. No technology for attaining Level II standards is now in use by the industry. Recommendations are based on a pilot study in the crumb rubber emulsion process. No further confirmation is yet available. The system consists of duel media filtration and activated carbon columns. Requirements for the removal of COD in the three types of effluent flow reduces final level from 500 mg/1 to 130 mg/1 (crumb emulsion and latex) and from 250 to 130 mg/1 (crumb solution). The proposed methods have not been tried on wastes from solution crumb rubber or latex plants. The data presented does not give sufficient support for the Phase II levels proposed.

Cost, Energy, and Non-Water Aspects

Costs proposed for level BPT are based on demonstrated technology. Costs for BAT must be considered very approximate since the method has not been demonstrated in the industry. Non-water aspects are important only in problems of sludge disposal.

New Source Performance

The same criticism applies to new source requirements as those pointed out for BAT.

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SEAFOOD PROCESSING

ESWQIAC REPORT ON THE SEAFOOD PACKING INDUSTRY

General

After considering the report prepared by the Contractor and the information gathered from three meetings held with representative of industry, ESWQIAC considers that the Contractor's report needs a thorough revision, additional data, and an second thought on the recommendations for treatment technologies, as well as the recommended guidelines for BPT and BAT.

Industrial Categorization

The Contractor recommends seven groups or categories according to the seafood to be processed. This includes Catfish, Blue Crab, Dungeness and Tanner Crab, Alaskan Shrimp, other shrimp, and Tuna. ESWQIAC considers that this suggested categorization can be simplified according to the receiving body of water rather than by the nature of the fish, and recommends only three(3) categories, as follows:

Category A: Seafood packers discharging into ocean, coastal or tidal waters.

Category B: Seafood packers discharging into inland waters.

Category C: Packers located at extreme cold areas.

Parameters

The Contractor's selection of parameters is based on BOD, COD, suspended solids, Kjeldahl Nitrogen, oil land grease. As the recommendations made by the Contractor are based mainly on air flotation and screening methods to attain reduction in BOD and suspended solids, it is the opinion of ESWQIAC that the parameters of Nitrogen, Oil and greases is of little importance in this particular case. The Contractor discusses the analysis of grease and oils, indicating that no good method has been developed that could be applied to the seafood industry. The Contractor admits that the method for oil and greases described in "Standard Methods" is not satisfactory for the seafood packing industry.

Kjeldahl Nitrogen: ESWQIAC is of the opinion that the parameter of nitrogen is of little importance in this industry, and thus should not be included. Oil and grease are normal components of seafood, especially Category H. Its control and removal will be very difficult to attain with the treatment recommended by the Contractor. These oils, when discharged, form a sleek which readily dissapears in the ocean waters and utilized by fish as food.

General Comments

1. The data gathered by the Contractor appears to be inadequate, highly variable, and very limited to reach adequate conclusions. The data reported in some cases, it appears, is erroneous and misleading. There are high variations on the samples analyzed for some of the industries.

2. No consideration of RWL is given, which results in wide variability of the parameters involved. For example, there are 12 different kinds of tuna. The RWL depends on the particular tuna being process on a particular day. The data gathered by

the Contractor shows the variabilities, but no consideration is given in reaching the recommended guidelines. As well, no consideration is either given as to the products being manufactured or processed. Age of plant apparently was not either considered.

3. P.L. 92-532, Sect 102 (d) exempts fish wastes from the Act, as these fish products provide food for the marine and aquatic life. No consideration of this Act is given in the report. ESWQIAC considers that since the fish packers waste are originated in the ocean and is food for marine life, considerations should be given to this point. In fact, the exemption of the fish packing industry from P.L. 92-500 is based on the utilization of the wastes as food by the fish population.

4. Air flotation is based on operations at one plant, and on laboratories studies. It is an unproven, costly technology which will remove very little BOD. Air flotation cannot be considered as BPT.

5. Although the effluent guidelines recommendations are less stringent than those being applied at several States (Washington, Alaska, Oregon) it is possible that the Contractor has a good point in recommending aerated lagoons rather than secondary treatment plants for those packers discharging into inland waters. The use of lagooning is a logical approach to this problem, and at the same time provides industry with a less costly alternative. The use of aerated or anaerobic lagoons, however, must take into consideration that the high salt discharges discourages the use of anaerobic methods. Although studies have demonstrated that biological aerobic process on

high chloride waters could be satisfactory, in these cases the chloride concentration should be constant. The effectiveness of any form of biological oxidation remains to be demonstrated under extreme variations common in the fish process industry.

6. The use of roughing filters and activated sludge for Level III is not practical for the seafood industry. The seasonal nature of these operations makes the activated sludge process not suitable for the industry.

7. Air flotation techniques for the shrimp industry is based on future demonstration, not on BPT.

8. Airflot methods are unproved and highly costly to the industry, and may take out of business some of the small shrimp and crab packers. Its efficiency for BOD removal is very small.

9. No consideration is given by the contractor to the "stickwaters". This is a very important consideration in those tuna or fish plants with no reduction units or where no pet food is manufactured. The BOD of the stickwaters is as high as 20,000 mg/1. The RWL of the "end of pipe" should not show BOD from the stickwaters.

10. The Contractor should base the recommendation on screening of the thaw waters. Other wastewaters should be either barged or used for pet food or other by-product.

11. The Contractor indicates that hypothetical system engineering developed for each alternative and design was based on probable effluent reduction estimates and Contractor's best judgement, based on "extensive engineering experience".

Where aerobic methods have been recommended, these have been based on judgement rather than in-plant operation. ESWQIAC considers that the recommended guidelines for BPT should be based on actual plant or exemplary plant operation rather than on Contractor's best judgement or engineering experience.

12. The cost curves utilized (VIII-13) does not appear correct, as they must be exponential when approaching 100% reduction. The curves developed by the Contractor shows the exponential relation at the start. This does not appear correct.

13. Screening is a normal procedure throughout the industry; it should be mandatory for those packers which are not using it or in which the screens used are not affective.

14. ESWQIAC agrees with the Contractor's recommendation for aerated lagoons for the catfish and those industries which are located inland. ESWQIAC considers that secondary treatment facilities as activated sludge would not work properly in those industries whose operation is seasonal or when the RWL is too variable. Secondary treatment in the form or of activated sludge or thickling filters should not be mandatory.

15. BOD and suspended solids data for the tuna plants appear to be in error.

16. The seasonal operations and the fact that some plants work only a very limited number or days during the years makes the use of activated sludge plants very difficult and probably in operative (see Figure 1). As well, since the operations are only a few days a year at some plants, especially those at Alaska, the effluent guidelines should be based on operations

that could be economically and operationally justified.

Recommended Guidelines-Contractor's Estimate

Recommended guidelines for BPT or Level I by Contractor are indicated in Table I.

TABLE I

CONTRACTOR'S RECOMMENDATIONS FOR BPT

Category	Product	Contractor's Estimate				Industry Estimate	
		mg/1		Lb/ton			
		BOD	SS	BOD	Susp. Solids	BOD	Susp. Solids
A	Catfish	83	245	0.4	0.4	20	20
B	Blue Crab	168	168	2.4	2.4	14	2.7
C	Blue Crab-Mech.	33	33	0.4	0.4	69	32
D	Alaska	236	66	11.4	3.2	186	130
E	Crab-Other	236	66	11.4	3.2	24	8.5
F	Shrimp-Alaska	1034	854	138	114	410	490
G	Shrimp-Other*	1200	274	140	32	270	170
H	Tuna	443	139	16.6	5.2	48	28

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* West

There should be no doubt that the industry recommendations are much higher than BPT should be, thus, industry recommendations should not be followed. On the other hand, ESWQIAC agrees with industry that air flotation nor activated sludge are proven treatment technologies and should not be applied to Level I nor considered as BPT.

ESWQIAC Recommendations

1. As the fish packing industry is located at the shorelines, the effluent guidelines should include adequate dispersion of the composite effluent (which includes thaw waters, retort cooling, floor washing). BOD of this waste is about 700 mg/1. The dispersion to attain should allow a dilution of 1:225 at a point one mile in diameter from the point of discharge. Although the Act does not provides for dilution, the seafood packing industry wastes are indigenous to the sea, and thus in this case the diffusion of the wastewaters should be considered to prevent discoloration of the waters, bad odors, and lowering of the DO of the receiving ocean waters. The dilution of these wastewaters is a common practice among the best plants in the country. Cost of a diffusion system is about $35,000 for a 200 ton plant. Operation costs are negligible. (See Figure 2).

2. EPA should investigate if P.L. 92-532 is in conflict with the discharge of wastewaters from the seafood packing industry. The law excludes this industry from the dumping of wastes to the ocean.

3. Oil and grease, as such, should not be a parameter for the seafood packing industry. The oil and greases are natural and common on the fish. The methods to remove these natural oils are too difficult and expensive. Kjeldahl Nitrogen should not be included as a parameter, as there is little control of this constituent when using creens and air flotation methods suggested by the Contractor.

4. The seafood packing industry is a seasonal industry. Secondary treatment should not be mandatory.

5. Cost estimates by the Contractor should be revised.

6. The use of aerated lagoons would not work on certain areas. Most of the seafood packing industry is located on the shoreline, and thus the water table is too close for the operation of the lagoons.

7. Industries discharging into river basins should provide aerated lagoons or similar treatment.

8. Level II is based on oxidation ponds and aerated lagoons. This is not possible when the industry is located near the shoreline. Level II criteria should be revised.

9. The zero concept discharge would be very difficult for the seafood packing industry. Huge amounts of water are used for thawing of the fish in many cases. One ton of tuna, for example, requires about 4-5,000 gals of sea water for thawing.

10. Stickwaters should not be discharged to the shoreline waters. Industry should follow the present practice of ocean barging used by some plants. (See Figure 3).

ESWQIAC considers too that the Contractor's guidelines for Level I are, although more restrictive than those suggested by industry, higher than what industry could attain. It is our opinion that the guidelines suggested by the Contractor are not realistic. BPT should be developed on:

1. Use of adequate type of screens.
2. Ocean dumping of stickwaters and other wastes with high BOD settleable and suspended solids. The dumping should be done by barging to safe area outside the coastal waters. This is normal practice in some plants.
3. Aerated lagooning for plants located inland or discharging to rivers, ocean with limited tidal or water.
4. Diffusion of wastewaters for those plants discharging to coastal waste exchange.
5. Climatological considerations.

ESWQIAC Recommendation for BPT

Based on the previous analysis, ESWQIAC makes the following recommendations for Industry categorization and BPT.

Category A: Seafood packers located in coastal areas

Stickwaters and Strong Wastes (BOD above 2,000 mg/1)

BOD, Lbs/ton: 10
Susp. Solids, Lbs/ton: 5

Discharge of thaw and other relatively clean wastewaters by diffusion to a depth of not less than 20 ft.

Category B: Seafood packers located inland

BOD Lbs/ton: 20

Suspended Solids: Lbs/ton : 10

Category C: Seafood packers located at areas with extreme cold climates.

BOD Lbs/ton: 40

Suspended Solids: 20

Basis for ESWQIAC Recommendations

1. BOD, suspended solids, Category A: Data from fish packing plants with adequate screening.
2. Diffusion of flow and other wastes, as practiced by some sea-food packing plants.
3. BOD and suspended solids data as reported by some plants.
4. Category B: Consideration as to seasonal operations and Contractor's data.

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SOAPS
AND
DETERGENTS

ES&WQIAC REPORT ON DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS SOAPS AND DETERGENTS INDUSTRY

This analysis of the Soaps and Detergents Industries is based on the Report #68-01-1517 by Colin A. Houston and Associates, Inc., and industry reports by the Colgate-Palmolive Company and Textize Chemicals Company.

WASTE CHARACTERISTICS

Waste characterization, as recommended by the contractor, is too diverse. The use of 18 sub-categories is too diversified and will be confusing in actual practice. As most of the industries discharge into municipal sewer systems and a high percentage are composed of the large manufacturers, it is the recommendation of the Committee that only two categories be included, large manufacturers and small manufacturers.

WASTE CATEGORIZATION

Fatty acids are the higher in BOD and COD. It is in the opinion of the Committee that it is preferable to remove the fatty acids from the soap and detergents list and include it in the organic chemicals because of the complexity of the molecule. At the same time, this will ease the reduction in categories. The Committee recommends that the fatty acids be excluded from this industry and be included in the Organic Chemical Industry.

POLLUTION PARAMETERS

The contractor recommends BOD, COD, suspended solids and oil and grease as pollution parameters. The Committee is of the opinion that since oil and greases are normal components of the soap industry and a composition in normal domestic sewage, this parameter should be deleted from the guidelines. The contractor apparently utilizes a factor of conversion for the COD based on the RWL for BOD. This is not necessarily correct. The strength of BOD in the RWL is about the same as for domestic sewage, according to the data reported both by the contractor and by industry. It is of further interest that the operation experience in the wastewater treatment plants in this industry indicates that although a 90 percent reduction can be attained by secondary treatment, this is not the case for the COD; thus, the basis of the contractor for recommending a reduction in COD of 90 percent is, in the opinion of the Committee, not correct.

It is noticed that no parameter for pH was included. The Committee is of the opinion that the parameter for pH should be included.

RAW WASTE LOADINGS

Raw waste loading for the different segments of industry as obtained by the contractor are included in Table I.

TABLE I

RAW WASTE LOADS SOAPS AND DETERGENT INDUSTRY

	101 Kettle Boiling	102 Fatty Acids	103 Soap From Fatty Acid Neutralization	104 Glycerine	105 Soap Flakes	106 Bar Soap	107 Liquid Soap	201 Oleum Sulfonate	202 Air SO_3 Sulfonation
BOD	6	12	0.1	15	0.1	3.4	0.1	0.2	3
COD	10	22	0.25	30	0.3	5.7	0.3	0.6	9
SS	4	22	0.2	2	0.1	5.8	0.1	0.3	0.3
OIL	0.9	22	0.05	1	0.1	0.4	0.1	0.3	0.5

	203 Solvent Sulfonation	204 Sulfamic Acid Sulfonation	205 Chlorosulfonic Acid	206 Neutralization	207 Spray Dry	208 Liquid Detergent	209 Dry Detergent	210 Drum Dried	211 Bar and Cakes
BOD	3	3	3	0.1	0.1	2	0.1	0.1	7
COD	9	9	9	0.3	0.3	4	0.5	0.3	22
SS	0.3	0.3	0.3	0.3	0.1	-	0.1	0.1	2
OIL	0.5	0.5	0.5	0.1	0.3	-	-	0.1	0.2

The contractor's recommendation for Level I are included in Table II.

TABLE II

Contractor's Recommendation for Level I

		BOD_5	COD	Susp. Solids	Surf.	Oil & Grease
101 -	Soap Manufacture Batch Kettle	0.6	1.0	0.4	—	0.1
102 -	Fatty Acid Manufacture By Fat Splitting	1.2	2.2	2.2	—	0.3
103 -	Soap From Fatty Acid Neutralization	0.01	0.03	0.02	—	0.01
104A -	Glycerine Concentration	1.5	3.0	0.2	—	0.1
104B -	Glycerine Distillation	0.5	1.0	0.2	—	0.1
105 -	Soap Flakes & Powders	0.01	0.03	0.01	—	0.01
106 -	Bar Soaps	0.34	0.57	0.58	—	0.04
107 -	Liquid Soap	0.01	0.03	0.01	—	0.01

Note: All categories have pH of 6 - 9.

ES & WQIAC RECOMMENDATIONS FOR LEVEL I

ES & WQIAC recommends that the industry be divided into two sub-categories instead of 18, as proposed by the contractor and that the fatty acid manufacture by fat splitting be included in the Organic Chemicals. Table III includes our recommendations for Level I.

TABLE III

ES&WQIAC RECOMMENDATIONS FOR LEVEL I SOAPS AND DETERGENTS

	Large Manufacturers	Small Manufacturers
BOD	0.9	1.2
Suspended Solids	0.6	0.8
pH	6 - 9	6 - 9

The criteria for these recommendations are based on an 85% reduction in BOD by secondary treatment. The slightly smaller percentage than that which can normally be attained by secondary treatment is based on differences in raw waste loads and to the whole industry rather than dividing it in several categories. It was also based upon the consideration that the concentration of these wastewaters is about the same as normal domestic sewage.

Recommended Level II guidelines are included in Table IV.

TABLE IV

ES&WQIAC RECOMMENDATIONS FOR LEVEL II SOAPS AND DETERGENTS

	Large Manufacturers	Small Manufacturers
BOD	0.6	0.8
Suspended Solids	0.4	0.6
pH	6 - 9	6 - 9

The non-water environmental aspects of odor and particulates will be monitored by the Clean Air Act.

Eutrophication and foaming are conditions caused in receiving waters by effluent from soaps and detergents, manufacturing processes and are excluded from consideration in this report.

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STEAM ELECTRIC POWER PLANTS

ES&WQIAC REPORT ON DRAFT DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR STEAM ELECTRIC POWER PLANTS INDUSTRY

General

A. Session with industry representatives, July 27, 1973

1. Subcategorization of the industry was inadequate according to industry representatives. Factors they felt should be taken into consideration include raw water quality, type of coal, climate, land availability, and water availability with respect to water rights. The industry maintained that there were substantial differences among sites: on sea water; where large amounts of fresh water are available; and relatively arid areas. The type of coal used and the climate in which the plant is operating have major effects on residuals, such as cooling towers in the case of thermal residuals.

2. Capacity factor rather than hours of operation was considered to be the most relevant criterion for determining type of plant: base load, cycling, or peaking.

3. The temperature of the discharge stream rather than thermal units should be the criterion for the standard. In effect, what the industry was requesting was the use of water quality as the criterion, rather than the fixed constraint on quantity of heat discharged. (The traditional approach of a mixing zone was the basic suggestion by the industry.)

4. Cooling tower requirements should not be restricted to a particular kind of cooling tower design. Any procedure which would achieve the objective should be permitted. (But,

it should be noted that evaporative devices have the adverse consequence of adding to consumptive use of water. This may be a problem in water-short areas.)

5. The categorization of nuclear plants was considered inadequate. Westinghouse opted for a separate category of open sea, nuclear sites.

6. The Atomic Energy Commission representative maintained that more consideration needs to be given to nuclear plants, in the context of NEPA requirements. Hearing and licensing procedures impose additional constraints (although it was not clear exactly what was implied by this observation).

The Contractor's report fails to consider emergency core cooling designs and costs. The question of safety is paramount with respect to nuclear plants; hence, it might well require additional consideration with respect to subcategorization of the industry.

7. In order to achieve the degree of recirculation imputed in order to minimize or eliminate thermal discharges, some substantial degree of cooling water chemical treatment will be necessary. This will increase the total dissolved solids load generated per kilowatt hour. The question then is the extent to which cooling tower blowdowns will be permitted to be discharged. If not, this will required extensive desalination operations. This in turn will generate a brine which will require disposal, which in itself is a difficult problem, as found in connection with desalting plants. (The

Contractor opts for evaporation, but does not indicate to what extent evaporation is feasible; what is to be done with the final dry solids.

8. Inadequate consideration was given in the contractor's report to the problem of costs which will be incurred during the down time required to retrofit existing installations to meet the 1977 standard. Either substantial additional costs will be incurred through purchasing energy from other systems-- if available, or through speeding up investment and construction of planned power plants --- if possible. Alternatively, if these procedures cannot be implemented in time, the result will be some inability to meet energy "demands". Presumably, there will be some damage costs associated therewith, as in the case of flood losses.

9. The Forked River plant in New Jersey, a nuclear plant, does meet the salt spray from salt water cooling towers standard.

10. It was suggested that a minimum size plant (per unit or per plant?) be established, such that the effluent standards would not be applied to any units below that size. The precedent of the implementation of the air quality act in this regard was noted, wherein, the limits were 25 megawatts or 100 negawatts. The latter appears to be the lower limit with respect to the air quality standards. The use of such a minimum size would probably reduce costs to meet the standards significantly, both with respect to the high cost associated

with small units and with respect to the ability to continue to use the small units while larger units were being retrofitted to meet the indicated standards.

B. Comments on Cost, Energy, and Non-Water Quality Aspects

1. The Contractor's report appears to have ignored the impacts of air pollution controls on heat rate, and hence, on thermal residuals generated per net kilowatt output. Some gaseous emission control measures, i.e., electrostattic precipitators, wet scrubbers, have significant energy requirements. Failure to analyze this problem is a significant deficiency in the report.

The impact of air pollution controls on power plant costs could very easily, and usefully, have been shown on Figures B-VIII-1 through B-VIII-17, i.e., by calculating and displaying corresponding costs for 10,50,80, 90%, etc., removal of particulates and SO_2-- for specified quality of coal, boiler type, etc.

2. More clarity in presentation and more adequate consideration should be given to: the additional energy costs associated with reduction in thermal discharges; and the impact on consumptive use of water. Simply displaying one table for one size plant in one location (apparently near Lake Michigan, by virtue of title of Reference 104), provides no indication of variation in these effects by geographic location. A range of climatic conditions, similar to those implied by the alternative wet bulb temperatures used (in the above mentioned figures), could have been posited and analyzed. As an example,

data on alternative cooling systems for the proposed Carolina Power and Light 3600 MW pressurized water reactor are shown in the attached table.

It should be noted that the use of a cooling lake obviates the need for chemical additives to a closed cycle cooling water system. The "net consumptive water use" data in the table should be compared with the data in Table B-VIII-13, in which average annual evaporation (presumably wet) is shown, rather than the drought conditions used for the CP&L data. The latter represent the critical conditions.

Note: Whether or not all the externalities -- both minus and plus for the cooling lake are included is not known.

SHEARON HARRIS PROPOSED 3600 MW NUCLEAR POWER PLANT COOLING WATER ALTERNATIVES

	Spray Pond	Mechanical Draft Cooling Towers	Natural Draft Cooling Towers	Cooling Lake
Initial Capital Cost 10^6 $	44.0	66.9	95.3	53.0
Annual Carrying Charge on Capital Investment 10^6 $	6.42	9.75	13.9	7.75
Capacity Penalty 10^6 $	0.56	0.56	1.39	Base Case
Energy Cost 1/ 10^6 $	1.60	1.45	0.86	0.01
Maintenance 10^6 $	0.25	0.42	0.24	0.03
Total Annual Operating Costs 10^6 $	9.095	12.44	16.65	8.05
In-House Power Comsumption, MW	117	116	140	Base Case
In-House Energy Use, 10^6 KWH	318.5	287.8	170.8	2.0
Net Comsumptive Water Use, Drought Conditions, ect.	144	140	133	98

1/ At 5 mills per kwh, the 1971 system production cost for CP&L

Source: Personal communications, J.A. Jones
Exec. V.P. CP&L. ltrs. dtd. 5/9/73 and 6/26/73

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TEXTILES

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE TEXTILE INDUSTRY

BY: A.D. Little, Inc. Review by: DEB

General

The report contains considerable information on the total numbers of mills and the total volume of water used, that cannot be translated into meaningful information usable in establishing guidelines for effluent discharges.

The Contractor makes many brash statements that start with "We estimate---" and he does not substantiate his statements.

Industry Categorization

The eight categories established by the Contractor seem to be reasonable divisions of the industry and they are acceptable for the discussions and presentations of data. There is, however, considerable overlapping in several and in practice, there are innumerable changes in product and processes within each category.

The categories designated by the Contractor are:

1. Wool Scouring
2. Wool Finishing
3. Greige Goods Mills
4. Woven Fabric Finishing
5. Knit Fabric Finishing
6. Carpet Mills
7. Stock and Yarn Dyeing and Finishing
8. Specialized Finishing

Waste Characteristics and Pollution Parameters

The parameters selected by the Contractor to evaluate the wastes from the several categories are:

* 1. BOD_5
* 2. COD
* 3. Suspended Solids
* 4. Phenols
5. Oil and Greases
6. Dissolved Solids
7. Toxic Organic Chemicals
8. Phosphates
* 9. pH
*10. Color
11. Alkalinity
12. Temperature
13. Sulfides
14. Chromium
15. Other Heavy Metals
16. Ammonia Nitrate Nitrogen
17. Coliform Bacteria

The reported difference in toxicity between hexavalent and trivalent chromium prompts the Committee to suggest that the tests for these two be included among the tests to determine waste characteristics, instead of total chromium.

The toxic organic chemicals may be present if they are used in the control of parasites on sheep or the moth-proofing of woolens.

In-Plant Control and Treatment Technology

The Contractor's report presents some fifty pages and seventy references to the matters of in-plant control and treatment technology in a rather unorganized fashion.

The Contractor's report says, "At present, the Textile Industry is concerned principally with end-of-pipe treatment of its wastewaters. However, the application of wastewater treatment technology has often been instituted without detailed investigation of the alternatives to water and wastewater management within the process operations. The textile industry relies principally upon biological treatment of its wastewaters at the end-of-pipe. A large number of plants (mills) especially, small ones, send wastewaters into municipal sewage systems where they may be a minor portion of the total flow; however, in some instances, the wastewater flow to a municipal plant is predominently wastewater from textile plants (mills)."

---

* Only these parameters have been used in the guidelines.

New process technologies that may be used in the future to lessen wastewater problems are:

1. Solvent Processing
2. Recovery and Reuse of Warp Suze

With the rapid changes in fiber processing, it is difficult to incorporate pollution reduction practices, using equipment, with each change in mill operation.

Figure VII-2 from the Contractor's report, with additions, is presented for consideration. The disposal of the materials extracted from the wastewaters is not given the attention that is needed for these sizeable problems.

Many of the tertiary processes proposed have not been used by the textile industry and the peculiar characteristics of the textile wastes will make adaption of these proposed processes quite difficult.

Cost, Energy and Non-Water Quality

The Contractor's report gives information on the costs of construction and operation, but does not include anything in the conclusions on this subject.

It is reasonable to believe that biological treatment with possibly some chemical pre-treatment can be tolerated by the industry at the present time and in the near future, but the following costs for tertiary treatment appear on examination to be outside of the BPT range.

Evaporation - $2.90 to $3.56 per 1000 gallons

Reverse Osmosis - $3.56 to $4.02 per 100 gallons - even though credit is given for the water recovered and reused.

Any wastetreatment operation that increases the cost of the final mill products 3 to 9 cents per pound hardly be considered "practical".

Best Practical Treatment

Table IX-10 from the Contractor's report has been modified to show additional information and it is attached. The water use figures are the median values given by the Contractor.

The flows for carpet manufacturing vary from about one-sixth of the mean to 3 times the mean. This would mean that the BOD of the effluent might vary from 13 to 234 mg/1 for the same pounds of BOD discharged. The one effluent would be considered as excellent and the other would probably be considered unsatisfactory.

The guidelines should provide a suggested means for handling situations like the above.

The suggested limits for wool scouring wastes can hardly be considered satisfactory effluents for discharge to naviable streams.

The limits for total chromium, phenols and color may be unduly restrictive for BPT and as recommended by the Contractor and they depend to a great extent on water usage. As recommended, they do not encourage water conservation.

The guidelines should include a factor for seasonal variation for the effluents from biological processes indicated on page 121A, a graph in the Contractor's report.

The Contractor states on page 48 of his report, "As a pollutant parameter, color is an aesthetic rather than a toxicity problem, and there is no universally accepted monitoring method although several techniques are being tried." Then, goes ahead and sets a guideline standard of not more than 200 ADMI units. This proposed guideline does not encourage conservation of water.

Best Available Technology

The Contractor is probably much to optimistic to believe that "Zero Discharge" can be attained technologically or economically by July 1, 1983. To attain progress in the improvement of the waters of the country without undue economic stress, complicated with extended legal actions, it is recommended that the guidelines for BAT be set at one-half the values indicated for BPT.

This arrangement will permit time to develop operating techniques for the advanced waste treatment facilities that will be required to meet the BAT guideline figures.

New Source Performance Standards

A new textile mill should be required to provide facilities so that there is no discharge of pollutants to navigable streams.

Pre-Treatment Standards

The Contractor's report, page 145, Item 3, should be reviewed to determine after due consideration whether hexavalent chromium should be admitted to a municipal sewer system.

Summary

It is suggested that trivalent and hexavalent chromium analyses be included as parameters of textile waste evaluation.

Tertiary treatment costs for textile wastes are excessive at this time and the addition of these to secondary treatment costs cannot be expected to be tolerated.

Excessive conservation of water can result in treatment plant effluents of small volume but high concentration.

A clarification of the recommended color standard is essential before the guidelines are adopted.

Seasonal variations in biological waste treatment plants must be indicated in the guidelines.

Zero discharge should not be considered possible for BAT.

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TIMBER PRODUCTS

ES&WQIAC REPORT ON DRAFT DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR TIMBER PRODUCTS INDUSTRY

WOOD PRESERVING ONLY

CONTRACTOR: Mississippi Forest DEB
Products Laboratory

General

The Contractor made an honest effort to obtain information regarding this widely dispersed industry. The data on "Wood Preserving" has been combined with the manufacture of veneer, plywood, and hardwood. It is suggested that the final publication be in two volumes so that the users will have less difficulty in locating the information pertinent to their problems.

Industry Categorization

The wood preserving industry is divided into four (4) subcategories that appear to be adequate for this section of the industry. The subcategories are:

1. Pressure processes employing oily preservatives in which the predominant method of conditioning green stock is by steaming or vapor drying.
2. Pressure processes employing oily preservatives in which the predominant method of conditioning green stock is by Boultonizing.
3. Pressure processes employing water borne salts.
4. Non-pressure sources.

Water Use and Waste Characterization

The wastewater characteristics vary with the particular preservative used, the volume of stock that is conditioned prior to treatment, the conditioning method used, and the extent to which effluents from the retorts are diluted with water from creosote and penta-chlorophenol treatments have high phenolic, COD, and oil contents and they may have a turbid appearance that results from emulsified oils. They are always acid in reaction, the pH values usually fall within the 4.1 to 6.0 range. They are always acid in reaction, the pH values usually fall within the 4.1 to 6.0 range. The COD is often 30,000 mg/1.

Wastewater from the wood preserving industry is isually relatively treatable.

The raw waste loads are based on data obtained from six plants.

The pollution parameters that were selected by the Contractor are:

1. Phenols
2. BOD_5
3. COD
4. Dissolved Solids
5. Suspended Solids
6. Oil and Grease
7. pH
8. Copper
9. Chromium
10. Arsenic
11. Zinc
12. Fluorides
13. Ammonia
14. Phosphorous
15. Temperature

(Boron is an involved element but is not listed)

TABLE 38

AVERAGE RAW WASTE LOADINGS FOR FIVE WOOD PRESERVING PLANTS

	Raw Waste Loadings*		Raw Waste Loadings/day(Kg)**		
Parameter	(mg/1	(Kg/1000 m^3 Prod)	Max.	Min.	Avg.
COD	19,269	5,378.4 (335.1)	1,651.9 (3,634.1)	502.9 (1,106.3)	1,016.0 (2,235.2)
Phenols	182	51.4 (3.2)	12.8 (28.2)	6.3 (13.8)	9.6 (21.1)
Oil and Grease	297	83.5 (5.2)	37.5 (82.5)	7.5 (16.4)	15.6 (34.4)
Total Solids	5,280	1,463.8 (91.2)	470.7 (1,035.5)	109.5 (240.9)	278.4 (612.5)
Dissolved Solids	4,571	1,276.0 (79.5)	387.4 (852.2)	93.5 (205.8)	241.0 (530.2)
Suspended Solids	710	199.0 (12.4)	87.2 (191.9)	12.2 (26.8)	37.5 (82.4)

pH 4.9

Average flow - 52,990 lpd (14,000 gpd)

Void vol. of cylinders - 411 m^3 (14,517 ft^3)

1971 production (est.) - 53,867 m^3 (1,902,258 ft^3)

Average work days/year - 285

Average daily production - 189 m^3 (6,674 ft^3)

Preservatives - Creosote, Pentachlorophenol

* Parenthetical values in pounds/1000 ft^3

** Parenthetical values in pounds

Control and Treatment Technology

The status of pollution control activities was based on a recent survey of 377 plants from which the data from 207 was used. The approach tothe pollution problem taken by many plants is to store their wastewaters on company property. Forty-two percent of the plants reporting use this method. Seventeen percent are releasing wastewaters without treatment. Fourteen percent discharge to sanitary sewer systems. Of this group, 63 percent discharge raw waste to the sewers and 37 percent are giving partial treatment before releasing their wastes, nine percent of the 207 plants reporting provide the equivalent of secondary treatment before releasing their wastewaters. Eighteen percent either have no wastewaters, or are disposing of it by special methods such as evaporation or incineration.

Sixty percent of the plants surveyed indicated that they currently meet state and federal water pollution standards. Twenty-five percent state that they do not meet these requirements and 15 percent do not know whether they do or not.

Storm water becomes contaminated as it flows over areas saturated with preservation from spills and leaks. Areas of particular concern are those around and in the vicinity of treating cylinders, storage tanks, and separators and usually because these areas are not large, it is practical to reduce the volume of storm water that must be treated by constructing dikes and drainage ditches around the areas to prevent uncontaminated water from flowing across them.

Wastewater treating facilities have been installed and are in operation at only about 9 percent of the estimated 390 plants in the United States. Most of the treatment facilities have been in operation only a very short period of time.

Primary treatments for creosote and pentachlorophenol-petroleum wastewaters usually include flocculation and sedimentation.

It is the intermingling of the oils and water from the treating cycle and the condensate from conditioning operations that is responsible for most of the pollution problem in the industry. Oils are said to account for most of the oxygen demand, serve as carriers for concentrations of pentachlorophenol far in excess of those attainable in oil-free water, and create emulsion problems.

Control of oils in probably the key to pollution control in this industry. Most wood preserving plants have oil-recovery systems that reclaim a high percentage of the oil that becomes entrained in water during processing. The free oils are recovered from wastewater by gravity separators. A few plants have installed airfloatation equipment for oil removal. Separators of various kinds will remove from 60 to 95 percent of the free oils and 0 to 90 percent of the emulsified oils.

Heavy metals are contained in wastewater from plants that are treated with salt-type preservatives and fire retardants. These are toxic to microorganisms in low concentrations and must be removed before subjecting the wastewater to secondary treatment involving biological treatment.

The various biological processes have been used in pilot and commercial sizes for the treatment of wood processing wastes. Chemical oxidation, and activated carbon alone and in combination for secondary treatment.

The Contractor did not visit plants that dispose of their raw wastes by discharging them to a sewer or those that simply store their wastes on site. About thirty plants in the U.S. were visited and these either gave their wastes secondary treatment or its equivalent or have no discharge.

Cost, Energy and Non-Water

Supplement "A" was not available at the time of the preparation of this summary. The information given for the several treatment was presented.

A-- Oil Separation

B-- Coagulation and filtration

C_1- Biological treatment in aerated lagoons

C_2- Biological treatment by activated sludge

D--Chlorination as a polishing treatment

E--Effluent measurement

The waste loading cost an quality of effluent which is expected from each stage of treatment suggested is as follows:

		mg/liter				
	Raw	Treatments				
Parameter	**Waste**	**A**	**B**	**C**	**D**	**E**
COD	40,000	7,260	3,630	410	300	
BOD	20,000	3,670	1,865	260	50	
Phenols	190	190	190	2.5	0.5	
Oil & Grease	1,500	225	80	45	25	
Suspended Solids	700	700	350	125	100	
		Costs (14,000 gal. of waste)				
Capital		$29,760	$43,320	$21,120 (120,000)	$8,400	$3,600
Per 1000 gal.		$1.17	$2.19	$2.64	$2.45	$.60

The total capital costs for complete treatment with lagoons $106,200 and the annualized costs for the same system were stated to be $9.06 per 1000 gallons.

The total capital cost for complete treatment with activated sludge $205,080 and the annualized costs for this system were stated to be $13.02 per 1000 gals.

The cost of oil separation plus evaporation was estimated to be $22.67 per 1000 gallons of excess water evaporated.

These costs are very high and it is difficult to see how this industry can incorporate them into their production costs within the time limits that have been established.

BPT

The BPT suggested by the Contractor is shown in Table 73, 74, 75, and 76, as attached.

BAT

The following treatment models are suggested:

Treatment Models Achievable by July 1, 1983

Biological

U

1. Oil Separation
2. Equalization
3. Chemical Coagulation
4. San Filtration
5. pH Control
6. Biological Oxidation
7. Secondary Clarification
8. Chlorination

V

1. Oil Separation
2. Equalization
3. Chemical Coagulation
4. San Filtration
5. pH Control
6. Soil Irrigation

W

1. Oil Separation
2. Equalization
3. Chemical Coagulation
4. San Filtration
5. pH Control
6. Biological Oxidation - 1
7. Biological Oxidation - 2
8. Secondary Clarification

X

1. Oil Separation
2. Equalization
3. Chemical Coagulation
4. San Filtration
5. pH Control
6. Biological Oxidation
7. Secondary Clarification
8. Carbon Filtration

Physical

1. Oil Separation
2. Equalization
3. Chemical Coagulation
4. Evaporation

1. Oil Separation
2. Equalization
3. Chemical Coagulation
4. Discharge to Sewer

It is unlikely that a conventional single-stage biological treatment alone will consistently achieve the effluent limitations required by July 1, 1983. Polishing treatments employing chemical oxidation, carbon filtration, or further biological treatment will probably be needed.

New Source Performance

Treatment Models - New Source Performance Standards

Biological

"U_1"

1. Oil Separation
2. Equalization
3. Chemical Coagulation
4. Sand Filtration
5. pH Control
6. Soil Irrigation

"W"

1. Oil Separation
2. Equalization
3. Chemical Coagulation
4. Sand Filtration
5. pH Control
6. Biological Oxidation - 1
7. Biological Oxidation - 2
8. Secondary Clarification

Physical

"Y"	"Z"
1. Oil Separation	1. Oil Separation
2. Equalization	2. Equalization
3. Chemical Coagulation	3. Chemical Coagulation
4. Evaporation	4. Discharge to Sewer

TABLE 81

STANDARDS FOR PERFORMANCE FOR NEW SOURCES

Parameter	1	2	3	4
Phenols	0.5	No discharge of process water permitted for plants in subcategories 2, 3, and 4		
COD	310			
BOD	50			
Oil & Grease	25			
Suspended Solids	100			

TABLE 82

RECOMMENDED PERMISSIBLE DISCHARGE OF METALS: PLANTS APPLYING DUAL TREATMENTS OF SALT-TYPE AND OIL-TYPE PRESERVATIVES, AND PLANTS USING A SINGLE RETORT TO APPLY BOTH PRESERVATIVES

Parameter	Concentration mg/1	Weight* (Kg/1000 m^3
Boron**	---	---
Arsenic	1.0	0.128 (0.008)
Chromium	1.0	0.128 (0.008)
Copper	1.0	0.128 (0.008)
Fluorides	10.0	1.330 (0.083)
Zinc	2.0	0.273 (0.017)

From Table 82

Parameter	Concentration mg/1	Weight* (Kg/1000 m^3
Phosphates	5.0	0.666 (0.041)
Nitrogen (NH_3)	5.0	0.666 (0.041)

* Parenthetical values in pounds/1000 ft^3 of product treated

** Best control technology for boron has not been determined

Summary

The advisability of having more than one concentration limit for BPT effluents es questioned.

It seems unreasonable to have limits of discharge for subcategory 1 and require discharge for other new source categories.

The lack of differentiation between trivalent and hexavalent chromium in the effluent limitations is questioned.

There should be some standardization of heavy metal concentrations in the guidelines of all industries where they are considered as pollutants.

A thorough study of the economic of waste treatment for this industry must be made to determine the impact of the costs on the industry and the purchaser of the products.

Boron should be handled in some limiting fashion.

TABLE 73

EFFLUENT LIMITATIONS BASED ON BEST PRACTICABLE CONTROL TECHNOLOGY CURRENTLY AVAILABLE: WOOD PRESERVING INDUSTRY (kilograms of pollutants/1000 m^3 of product)*

Sub-category	Wastewater Volume liters/m^3	Phenols	COD	BOD	Oil and Grease	Suspended Solids
1	267 (2.0gal/ft^3)	0.658 (0.041)	109.236 (6.806)	69.272 (4.316)	11.989 (0.747)	33.304 (2.075)
2	--	No discharge of process water permitted				
3	--	No discharge of process water permitted				
4	--	No discharge of process water permitted				

*Values in parentheses are discharge equivalents in pounds/1000 ft^3.

TABLE 74

EFFLUENT LIMITATIONS BASED ON BEST PRACTICABLE CONTROL TECHNOLOGY CURRENTLY AVAILABLE: WOOD PRESERVING INDUSTRY (milligrams of pollutants/liter of water)

Sub-category	Wastewater Volume liters/m^3	Phenols	COD	BOD	Oil and Grease	Suspended Solids
1	267 (2.0 gal/ft^3)	2.50	410	260	45	125
2	--	No discharge of process water permitted				
3	--	No discharge of process water permitted				
4	--	No discharge of process water permitted				

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Limitations are not placed on total water usage, color, and dissolved solids. However, when discharges containing color or dissolved solids may cause harm to the receiving waters, or cause a violation of existing water quality standards, limits must be established.

The pH of the final effluents from wood preserving plants should be within the range of 6.0 to 8.5.

TABLE 75

RECOMMENDED PERMISSIBLE DISCHARGE OF SPECIFIC POLLUTANTS IN NON-PROCESS WASTEWATER FROM WOOD PRESERVING PLANTS IN SUBCATEGORIES 2, 3, AND 4

	Plants in Subcategory 3	Plants in Subcategories 2 and 4
Phenols	0.1	0.3
BOD	25.0	25.0
COD	155.0	155.0
Oil and Grease	5.0	5.0
Suspended Solids	15.0	15.0
Arsenic	.25	--
Boron*	--	--
Chromium	0.1	--
Copper	0.5	--
Fluoride	1.0	--
Zinc	1.0	--

* Best control technology for boron has not been determined.

TABLE 76

RECOMMENDED PERMISSIBLE DISCHARGES OF METALS FROM WOOD PRESERVING PLANTS IN SUBCATEGORY 1 THAT EMPLOY THE SAME RETORT FOR BOTH OIL-TYPE AND SALT-TYPE PRESERVATIVES

Parenthetical values are discharge equivalents in pounds/1000 ft^3)

Parameter	Concentration (mg/1)	Weight ($kg/1000m^3$)
Arsenic	1.0	0.273 (0.017)
Boron*	---	--
Chromium	1.0	0.273 (0.017)
Copper	1.0	0.273 (0.017)
Fluorides	10.0	2.664 (0.166)
Zinc	2.0	0.532 (0.083)
Ammonia (as N)	5.0	1.332 (0.083)
Phosphorus	5.0	1.332 (0.083)

* Best practicable treatment for boron has not been determined.

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MATRIX METHOD

A Quantitative Method for Developing Effluent Limitations

ECONOMIC AND TECHNICAL CONSIDERATIONS IN THE ESTABLISHMENT OF INDUSTRIAL EFFLUENT GUIDELINES IN THE UNITED STATES

W.W. Echenfelder, J.A. Roth, and A.W. Edwards
Distinguished Professor of Environmental and Water
Resources Engineering, Professor of Chemical Engineering
and Environmental Engineering, and Graduate Fellow
in Chemical Engineering, respectively

Vanderbilt University
Nashville, Tennessee
U.S.A.

In the United States, Public Law 92-500, known as the Federal Water Pollution Control Amendment Act of 1972, was enacted to restore and maintain the chemical, physical, and biological integrity of the waters of the United States of America.

In compliance with this act, effluent limitations for point sources require the application of the best practicable control technology currently available by July 1, 1977, and, by July 1, 1985, the best available technology economically achievable must be applied. The Administrator of the Environmental Protection Agency was directed to publish within one year of enactment of this legislation, regulations, which provide guidelines for effluent limitations. These regulations include:

(1) identification of pollutants

(2) the degree of reduction attainable through the application of the best practicable control technology currently available for classes and categories of point sources.

(3) factors to be considered including a consideration of the total cost of application of technology in relation to effluent reduction benefits to be achieved.

The paper is concerned with aspects of the guidelines for effluent limitations which establish the best practicable technology currently available.

There are serious limitations in establishing definitive and specific effluent limitations for a major segment of American industry without adequate subcategorization of the industry. Differences in effluent qualities attainable within an industrial category may arise due to technical limitations of the wastewater treatment process and economic constraints imposed by size, age, or level of technology may result in serious competitive disadvantages.

The purpose of this paper is to present a methodology by which guidelines can be established, thereby:

(1) providing a technical and economic basis for BPT by subcategorization of the industrial categories.

(2) establishing a procedure to define definitive effluent qualities for the industrial subcategories defined by (1) above.

The proposed subcategorization considers four constraints on effluent standards of performance reflecting size, age, process technology and geographical location. These are:

(1) Treatment Technology - the effect of wastewater characteristics on effluent quality attainable by

the selected wastewater treatment process (BPT).

(2) Operational Characteristics of the Industry - seasonal operations, wide fluctuations in wastewater volume or strength due to multiproduct operations.

(3) Geographic and Climatic Considerations - spray irrigation and evaporation lagoons may be applicable to some areas of the country but not others; biological treatment in northern parts of the country is adversely affected by low temperature operation.

(4) Economic Equity - in some industrial categories smaller plants produce a higher RWL than do large plants. Economy of scale reflects higher treatment costs for smaller plants than large ones for the same process. Both of these factors may result in undue economic bias on smaller plants within an industrial category.

For each of the subcategories within an industrial classification effluent limitations are developed as follows:

(1) the RWL and wastewater flows per unit of production for the industrial subcategory are established statistically upon the data base. For purposes of the guidelines one standard deviation of the industry-wide wastewater flows is used for computation. Plants with water use in excess of this should reasonably be expected to attain this level by in-plant conservation practice.

(2) BPT for the subcategory is selected.

(3) the average effluent quality attainable is determined from process models reflecting present exemplary performance.

(4) the average effluent limitation is lbs pollutant/unit production is the product of (1) and (2).

(5) effluent variability is defined considering process operating temperature, variation in RWL, and variation in product mix.

Effluent Standards Model Development

(1) Develop statistical plots of RWL and flow for the industrial category. Determine if size, age, or type of process has a major effect and if so break the statistical plots accordingly. This is based on flow/unit production, BOD/unit production, etc. Eliminate plants which have extensive water reuse or product recovery not normally practiced in the industry. Base line flow/unit production is one standard deviation from the mean. Figure 1 shows a probability plot of water usage for simple slaughterhouses. Analysis of industrial data reflects that there is a random effect of water usage per unit production for meat packing sub-categories. In pulp and paper operations, however, some subcategories show definite trends of increased water usage per unit product as production rate decreases.

(2) Determine from wastewater treatment operating data on BPT (e.g., activated sludge) whether the wastewater characteristics, e.g., TDS, k, etc., have an effect on process performance under optimal design operating conditions. If so, categories should be established with appropriate effluent qualities.

(3) Define operational characteristics of the industry, e.g., seasonal, product mix variability and establish appropriate breaks relative to BPT, e.g., sludge for continuous operations, aerated lagoons for seasonal operations, etc. Establish BPT and effluent qualities for each grouping.

(4) Delineate geographical and climatic effects. BPT in some cases can be defined by area if spray irrigation or evaporation ponds are applicable. In all cases an alternative for discharge using wastewater treatment should be considered in the event that land availability or cost mitigates against the land disposal alternative. Wastewater characteristics, particularly temperature needs to be considered. For example, spray irrigation of a waste in cold climate areas may be feasible if the waste temperature is sufficiently high. Effluent quality from a biological treatment process should be adjusted for winter operation in cold climates.

(5) For each of the groupings defined in (1) the cost of compliance/unit production is generated. Selecting

the large plants with prevalent gechnology, BPT is defined and the costs computed. Costs are computed for all the other groupings using BPT defined above and for alternative wastewater treatment processes. Processes are selected and effluent quality defined for each grouping considering a reasonable cost equity.

(6) As additional data are compiled upon on-going operations, these data will be added to the data base for current best practical technology. Treatment models will be updated as the state-of-the-art advances.

Meat Packing Industry - Economic Equity

Both capital costs and annual operating costs were established from the North Star (2) cost estimates and correlate well for each waste treatment process as a function of total daily flow rate. These functions were extrapolated using the general effect of scale as established by AWARE (1). The water usage is random with production level in this industry. The subcategories were divided into small, medium, and large packing houses based on the EPA contractor's data (2). Average water usage and one standard deviation from the average were determined. Using these flow rates for each subcategory, the estimated annual costs (Figure 2) were determined. Annual costs were then calculated for each subcategory and are shown in Figure 2 reflecting the economy of scale.

The wide disparity in costs for large, medium, and small operations have not previously been established.

To illustrate the application of cost equity, by referring to Figure 3, cost per unit production rate would range from approximately $0.35/1000 lb LWK to $0.45/1000 lb LWK for simple slaughterhouses by requiring effluent standards attainable by treatment as follows:

small - anaerobic + aerobic lagoon
medium - anaerobic + aeration + aerobic lagoon
large - activated sludge

Requiring the same treatment for all simple slaughterhouses would impose severe financial disadvantages for small simple slaughterhouses. The disparity becomes greater in those industries which reflect greater water use of RWL in the smaller plants.

Fruit and Vegetable Processing Industry

The fruit and vegetable processing industry represents a case where operational characteristics markedly affect Level 1 technology. This is because:

(1) much of the processing is seasonal, resulting in highly variable or intermittent waste loadings.

(2) the wastes in general are readily biodegradable by conventional biological wastewater treatment processes.

(3) a major part of the industry is located in rural areas with land availability.

Industrial Categorization

It would appear that these industries can best be categorized in relation to their response to presently available wastewater treatment technology. The primary factors affecting this are:

(1) Biodegradability. This can be effectively defined in terms of a K rate, which would reflect the rate of degradation of the organics in the activated sludge process. Since the K rate is a function of the waste composition, a chemical complex with a high diversity of products would result in a statistically variable K. The K rate for a given industry would be defined by an appropriate laboratory or pilot plant study.

(2) TDS. Total Dissolved Solids exert a major influence on the effluent quality in terms of suspended solids. Increasing TDS results in a dispersed biological floc and an increase in effluent suspended solids. This should be factored in defining BPT or BAT for the particular industry in question.

These industries could be categorized by a matrix of the above parameters. BOD concentration might also be considered, although there is some question as to how significant influent concentration is as related to effluent quality attainable. For example, for a given wastewater increasing effluent BOD concentrations will result in increased effluent concentrations at the same F/M level. It is possible, however, even with increasing influent concentrations to maintain a given effluent concentration by readjustment of the F/M. It is felt that there are sufficient data available at the present time from operating wastewater treatment plants in the organic chemicals industry, from the published literature, from pilot plant studies, and from engineers' reports to establish a categorization as proposed above.

It is recognized that many organic chemical complexes contain compounds that are toxic or inhibitory to conventional biological waste treatment processes. To meet BPT that these compounds would either be removed at their source, pretreated by other technology (e.g., activated carbon), or that an alternative technology such as activated carbon would be employed for the entire waste stream to meet BPT standards.

Waste Characterization

Waste characterization is divided into three groupings. The first which impinges directly on the wastewater treatment process, i.e., biological treatment. The second that impinges on the effluent quality, but is not necessarily related to the biological treatment process, such as heavy metals. The third considers compounds particular to the waste stream in question, such as phenols.

(1) BOD, suspended solids, COD/TOC, TDS, nitrogen, phosphorous.

(2) heavy metals (Cu, Ni, Zn, etc.)

(3) specific organics such as phenol,nitrobenzine, toluene, etc.

Control and Treatment Technology

Level 1: Level 1 technology should nominally be considered as the effluent attainable from the activated sludge process. Requirements for heavy metal limitations and specific organics or toxicants would require supplementary or pretreatment. In considering activated sludge as BPT, variations in BOD and TDS would result in variations in effluent quality. For example, on one organic chemical waste evaluated it was possible to reduce the COD to 370 mg/1 in 0.5 days aeration. Reducing the COD to 275 mg/1 required 2.5 days aeration. It is questionable whether this increased reduction is justified in most cases for the cost involved in achieving it. Wastewaters with low TDS levels (less than 500 mg/1) can usually achieve effluent suspended solids levels of 30 mg/1. By contrast, high TDS levels (greater than 5000 mg/1) will usually produce effluent solids levels in excess of 50 to 100 mg/1. Since BPT is nominally assumed as the activated sludge process, there is effectively no reduction in nondegradable organics (COD). Whether this is a problem or not should be determined by appropriate bioassay testing. Appropriate bioassay testing can be an integral part of any permit issued.

Variability in Effluent Quality

It is recognized that many factors affect the effluent quality for a wastewater treatment facility. The principal factors are:

(1) variation in product mix which affects the composition of the wastewater and hence, the

rate constant, K.

(2) variation in concentration which directly influences the effluent concentration from the biological reaction rate.

(3) variation in other parameters, such as TDS, which could influence the effluent suspended solids.

The degree of variation will depend on the complexity of the chemical plant, variability in production rate, and the geographical location of the plant. In most cases operating data must be generated to clearly define what variability would be expected. There are techniques available to calculate what the effluent COD will be from any biological treatment process.

Technical Basis for Effluent Guidelines for Wastewaters Treated by the Activated Sludge Process

The activated sludge process is usually designed to produce an average specified effluent quality and to maintain a biological sludge suitable for gravity separation and recycle. The technical rationale for this guideline development is based on the fact that for an activated sludge process treating any organic wastewater there is an optimal F/M range over which best the effluent quality will be achieved for all pollutional parameters. As the F/M exceeds this value, the effluent soluble BOD and COD will increase due to incomplete removal and at some point the sludge settling properties will alter due to a change in the biological nature of the sludge. This may be caused by the development of filamentous organisms or dispersed growths.

As the F/M decreases below the optimal value over oxidation and floc dispersion results increasing the effluent COD, suspended solids, nitrogen, and phosphorous. If ammonia nitrogen is present in the wastewater, nitrification may occur resulting in dentrification in the final clarifier and floating sludge during warm weather operation. Once the optimum F/M is defined from laboratory or pilot plant studies it is possible from kinetic relationships to determine what the effluent soluble BOD will be under average operating conditions.

Using the material balance for activated sludge

$$\frac{S_o\,(S_o - S_e)}{x_v\,t} = k\,S_e \qquad (1)$$

where S_o = influent BOD at any time, t

S_e = effluent BOD at any time, t

k = biological rate constant, hr ^{1}

x_v = mixed-liquor volatile solids

t = retention time, hours

and the biological loading expression

$$F/M = \frac{24\,s_o}{x_v\,t} \qquad (2)$$

where F/M = food to microorganism ratio.
Combining equations (1) and (2) and rearranging,

$$\frac{s_r}{s_e} = \frac{K}{F/M} \qquad (3)$$

where S_r = BOD removal, $(S_o - S_e)$, mg/1
K = biological rate constant, days $^{-1}$

Figure 3 shows the effect of influent total dissolved solids on effluent suspended solids.

Variability in Effluent Quality

The above considerations will define the average effluent quality under summer operating conditions. Variation in effluent quality will result from changes in influent concentration, changes in the operating temperature of the aeration basin, changes in product mix which affects the overall reaction rate k and variation in effluent suspended solids which contributes to the total BOD. An extensive study of activated sludge plant operating data has been reported by the Union Carbide Corp. in their report to ESWQIAC dated August 31, 1973 (4). The formulation proposed by Union Carbide is:

$$BOD_t = (BOD_A) \quad 0^{(T_a - T)} \quad V + (B)\,(SS) \qquad (4)$$

where BOD_t = total effluent BOD at any time, t

BOD_A = average soluble BOD under summer operating conditions

0 = temperature coefficients

T_a = average summer operating coefficient

T = temperature, °C

V = effect of product mix variability. This can be considered a function of k

B = mg BOD/mg SS

SS = suspended solids, mg/1

This demonstrates the effect of temperature variability on an activated sludge treatment plant.

The effect of influent BOD variability and product mix treatability is not considered in this example by selecting S_o/Sa and V equal to unity. These variability data would be included as appropriate.

ES&WQIAC POSITION PAPER ON TOXIC MATERIALS IN INDUSTRIAL EFFLUENT POINT SOURCE DISCHARGES

(Section 307 of PL 92-500)

In establishing effluent limitations for the organic chemicals industry several alternative approaches can be considered. Since the diversity of production in most plants does not permit establishment of a statistical RWL based on units of production, the wastewater flow used to compute the effluent limitation will be only process wastewaters emanating from the plant. The resulting effluent limitations, using activated sludge as BPT could alternatively be based on process performance, e.g. selection of an optimal F/M or on an economic base such as $/lb BOD removed. Figures 4 and 5 show the effects of operating parameters on cost for activated sludge.

References

1. "Estimating Pollution Control Costs from Selected Manufacturing Industries in the U.S., 1973-1977,", EPA Report - Prepared by Associated Water and Air Resources Engineers, Inc., July, 1973.

2. "Development Document for Effluent Limitations, Guidelines, and Standards of Performance - Meat Packing Industry - Draft Report", Prepared by North Star Research Institute, June, 1973.

3. Union Carbide Corporation, Chemicals and Plastics Correspondence to Effluent Standards and Water Quality Information Advisory Committee, EPA, dated July 20, 1973.

ES&WQIAC POSITION PAPER ON TOXIC MATERIALS IN INDUSTRIAL EFFLUENT POINT SOURCE DISCHARGES

(Section 307 of PL 92-500)

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ES&WQIAC POSITION PAPER ON TOXIC SUBSTANCE REGULATIONS

ES&WQIAC has considered the materials on the toxic substance list authorized in Section 307 of P.L. 92-500 in the light of several hearings, basic data available to the committee, and comments from industry. The committee would like to draw several considerations to the attention of the Administrator and to present its comments with reference to this important requirement of the law. These comments are submitted for possible future guidance and have not been formulated with reference to legal interpretations of Section 307 or administrative and implementation restraints.

1. Adequate research has not been done on some of the materials proposed for a toxic list to insure accurate evaluation of their toxicity to aquatic, terrestrial, and human life when these materials are released in water.

2. Available data on some materials indicate that biomagnification in fish and invertebrates can far exceed levels tolerable for human or animal consumption although concentrations in water may be below levels detectable by usual field chemical procedures.

3. For some materials (cyanide) field chemical procedures are not available to give accurate assessment of the toxic form (HCN) and, further, the proportion of total cyanide which is made up of HCN cannot be predicted accurately when certain compounds subject to photodecomposition (ferrocyanide) are in the effluent. Turbidity, water color, temperature, pH, amount of sunlight, and time of day may alter the amount of HCN present.

4. A sliding scale of effluent limitation based on the degree of dilution places differential economic burden on discharges depending on

geographic location; further, increased effluent discharge based on amount of dilution in the receiving water will not necessarily protect organisms from the biomagnification alluded to above.

5. Rigid enforcement of effluent standards which guarantee absolute protection of all aquatic, terrestrial, and human life and prevent significant biomagnification has the potential of shutting down important segments of industry, particularly if present stipulated compliance deadlines are observed.

6. The requirements of best available treatment (BAT) of effluents by 1983 will satisfy most objectives of 307 by that date and application of best practical treatment (BPT) will minimize some problems.

In view of the considerations outlined above, the committee submits the following comments.

1. Effluent standards for toxic substances should be based on a preponderance of scientific evidence demonstrating effects on humans, terrestrial animals, or aquatic life depending on which group will be affected by the discharged materials.

2. It should be clearly stated and justified in support documents that effluent standards for particular materials are predicated on protection of human, terrestrial, or aquatic life, since concentrations affecting one group adversely may be essentially harmless to another.

3. Effluent standards should be based on total weight of material discharged rather than concentration since additive loadings from a series of plants could cause undesirable stream loadings regardless of the dilution factor.

4. Where potential biomagnification in fish and subsequent ingestion by animals or humans is the basis for establishment of an effluent standard demonstrated levels of accumulation should be established before promulgation of the standard.

5. Materials for which removal technology is not available should be omitted from the toxic list unless detriment to humans, terrestrial animals, or aquatic life at probable levels of ingestion of fish or invertebrates or direct exposure is demonstrated by a preponderance of scientific data.

6. The time limit for compliance should be extended sufficiently to permit installation of available removal technology.

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